Chinese Cross-listing

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy (Economics and Finance)

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Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

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Abstract

Since the re-establishment of the stock market in China in 1990, cross-listing[1] by Chinese companies has been growing constantly, and has become a complementary source of foreign capital inflows into the Chinese economy via international stock markets in addition to the inward foreign direct investment started in 1980. By the end of 2008, there were over 800 Chinese securities listed and traded in several major stock exchanges around the world, which have raised total capital amounting to over US$112 billion according to the China Securities Regulatory Commission (CSRC) Report (2008). The experience of Chinese companies' cross-listing in the international stock exchanges has, to some extent, provided an example of company-initiated bonding practices among the various bonding mechanisms such as diversifying shareholder base, opting into higher financial disclosure, and improving corporate governance.

With the increasing presence of Chinese companies listed and traded in the international stock markets, research on Chinese cross-listing is emerging as a new focus for academic research in the field. A number of studies have investigated the price disparity and price discovery between dual-listed Chinese securities (focus on Hong Kong and New York dual-listings); yet little is known about how bonding effects Chinese firms cross-listed in international stock markets, the price and market linkage among those dual- and triple-listed shares, and whether investment strategies could be developed from the price disparity phenomenon between dual-listed shares.

Building upon the existing literature on cross-listing, and using the data of listed Chinese companies during the period of 1993–2008, this study examines the relevance of the theories of the bonding hypothesis, cointegration and the law of one price in the context of Chinese firms' cross-listing in the international capital markets. The results suggest that Chinese cross-listings exhibit a bonding premium only in the United States (US) markets, while the non-cross-listed Chinese firms demonstrate better firm performance than those listed in London, Singapore and Hong Kong. Further, the results reveal that for all the listed Chinese firms, profitability rate and the leverage ratio play a

[1] In this study, the terms cross-listing, overseas-listing, international-listing, dual-listing, and triple-listing are used interchangeably to eliminate any possible conflict of semantics. All these terms have the same meaning when a security is registered for trading on more than one exchange. Dual-listing or triple-listing means a Chinese security is listed and traded on two or more exchanges.

positive role in improving the firms' performance. The adoptions of international accounting standards as a must-to-do corporate governance mechanism regulated by the host stock exchanges has less effects on Chinese firms' performance, but the adoption of Big Four auditing firms does. And the interaction between cross-listing with different corporate governance mechanisms have different effects on firms' valuation. The study suggests that merely borrowing a corporate governance mechanism does not guarantee the improvement of the firm performance.

Instead of using market indices, this study examines the short and long-term price linkages among the dual- and triple-listed Chinese securities in different stock markets over the period of 1993–2008. The empirical results reveal that most of the dual-listings traded in China A- and B-share markets, and the Hong Kong and New York stock markets exhibit a stationary long-run relationship. Some of the dual-listed China A- and H-share also exhibit cointegrated relationship. The results also suggest that Hong Kong and New York markets have a very strong interactive relationship in terms of the dual-listed stocks. The stock's total return index series for those cross-listed Chinese stocks are cointegrated and pricing errors are corrected almost immediately. Lastly, arbitrage opportunities for the 14 pairs of Chinese American Depository Receipts (ADRs) and their underlying shares traded in New York and Hong Kong markets were examined. It was revealed that a portfolio of 14 dual listed stocks earns an average daily return of 1.28 per cent over the period studied when transaction costs were considered and market risk was controlled.

This study contributes to the literature on the bonding hypothesis and firm valuation on cross-listing by constructing an integrated conceptual framework that explains why the bonding effect might not have explanatory power for all the cross-listed Chinese firms. As an exploratory study of corporate governance of Chinese cross-listings and investment strategy, this study also provides researchers with theoretical and methodological implications for future studies in this line of research. Further, it also proves that arbitrage opportunities existed for some of the dual-listed shares but risks are also associated with it.

Abbreviations

-2LL	-2 times log-likelihood
ADF	Augmented Dickey-Fuller
ADR	American Depository Receipts
ANOVA	Analysis of Variance
ASEAN	Association of South East Asian Nations
AIM	Alternative Investment Market
CAPM	Capital Asset Pricing Model
CAR	Cumulative Abnormal Return
CEO	Chief Executive Officer
CPA	Certified Public Accountant
CSRC	China Securities Regulatory Commission
G5	Group of Five. The G5 members are: France, Germany, Japan, the United Kingdom and the United States
GAAP	Generally Accepted Accounting Principles
GDP	Gross Domestic Production
GDR	Global Depository Receipt
GEM	Growth Enterprise Market
IAS	International Accounting Standard
IFRS	International Financial Report Standard
IPO	Initial Public Offerings
KOSDAQ	Korea Securities Dealers Automated Quotation System
LOP	The Law of One Price
NAFTA	North American Free Trade Agreement
NASDAQ	National Association of Securities Dealers Automated Quotations
OTC	Over the Counter
QDII	Qualified Domestic Institutional Investors
QFII	Qualified Foreign Institutional Investors
RI	Return Index
RMB	Chinese currency, Renminbi, with a notation of ¥
ROA	Return on Asset
ROE	Return on Equity
SEC	US Securities and Exchange Commission

SFC	Securities and Futures Commission
SFRS	Singapore Financial Reporting Standards
SL	Security Line
SML	Security Market Line
SOE	State-Owned Enterprise
ST	Special Treatment
UK	United Kingdom
US	United States
VAR	Vector Auto Regression

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Chapter 1: Introduction

1.1 Research Background

China, the most populous country and one of the four oldest civilisations in the world with a written history of more than 4,000 years, finally opened its doors to the outside world in 1979. The country has since undergone tremendous changes. In addition to the profound political and social transformations, the economic regime in China has been gradually converting from a centrally planned to a market-based economic system. One of the important and significant aspects of these economic transformations and reforms is the re-establishment of the stock markets in Shenzhen and Shanghai of China in the early 1990s. This has been followed by an established and gradually improved legal framework for governing the activities of the stock markets and financial markets. Lucrative opportunities unleashed by these developments together with the continuous rapid growth of the Chinese economy have attracted considerable attention from academic researchers, industry practitioners and policy makers to China's stock markets.[1]

Among all the transition economies around the world, China has followed a rather unique method to transform its Soviet-style centrally planned economy to a more market-oriented economy but still within the almost unchanged political system. This system has been termed 'Socialism with Chinese Characteristics' and can be viewed as one type of mixed economic system. Therefore, economic transformation has been taking place without political democratisation and without large-scale privatisation. Liberalisation has proceeded incrementally and privatisation was delayed until two decades after the initiation of the reforms, and yet to date, the country has achieved a high and stable economic growth rate. Over the past decades, China's economy has enjoyed average annual growth rates in excess of 9 per cent. The economy was recorded at an annual growth rate of 7.5 per cent during the period of the 11th Five-Year Plan (2006–2010). The 'once-in-a-century' global financial meltdown that occurred in the latter half of 2008 seemly hit China's economy hard, especially in the export sector,

[1] A reference to China refers to Mainland China in this study, which does not cover the securities markets in Hong Kong Special Administrative Region (SAR), Macau SAR and Taiwan Province of China.

which was badly affected with a significant slide in economic growth and a fall in earnings of listed companies. However, given the small size of overseas investments by China's enterprises and securities institutions, this global financial meltdown had a rather limited direct impact on China's securities markets (CSRC 2008).

Since its formation in 1990, the Chinese stock market has enjoyed rapid growth with the incremental development of China's market economy. By the end of 2008, China's stock market was the second largest in Asia after Japan,[2] with a total of 1,625 publicly listed companies and a market capitalisation of 12.13 trillion Renminbi (RMB),[3] which accounted for about 40 per cent of China's Gross Domestic Production (GDP) (CSRC 2008). The Shanghai Stock Exchange was ranked the sixth biggest stock exchange in the world by market capitalisation in 2008 (World Exchanges 2008), and all of this remarkable performance has been achieved under relatively poor legal and financial systems. China's stock market has been performing better than the markets of most other transitional economies as measured by the number of listed firms, market capitalisation, liquidity and fundraising capacity (Pistor & Xu 2005).

Besides the constant economic growth in China and the continuous reforms of the Chinese stock market, the more integrated international financial markets make it possible and easier for Chinese companies to list internationally. As the Chinese A-share market swings between an ultra-wide band, Chinese companies suddenly find themselves swamped with many choices as the overseas exchanges ease their rules to cosy up to the new Chinese listing candidates. Both state-owned enterprises (SOEs) and private Chinese companies actively seek to list internationally. The Hong Kong Stock Exchange and the New York Stock Exchange are not the only contenders for Chinese listings as they were at the early stage of the development of the Chinese stock market. Singapore, National Association of Securities Dealers Automated Quotations (NASDAQ) and the London Alternative Investment Market (AIM) have become the most popular destinations for Mainland Chinese companies. However, when it comes to

[2] On 16 July 2009, China overtook Japan as the world's second-largest stock market by value after the Chinese government stimulus spending and record bank lending boosted share prices in 2009, sending the value of China's domestic stock market to $3.2 trillion, compared with Japan's $3.20 trillion. The last surpassed Japan in stock market capitalisation was from 7 January to 24 January 2008 (Bloomberg News 2009).

[3] At the end of 2008, total free-float capitalisation of these 1625 companies listed on the two stock exchanges in Shanghai and Shenzhen was RMB 4.52 trillion, representing a decrease of 51 per cent from the end of 2007. The total market capitalisations in 2008 represent a 63 per cent decrease from the end of 2007.

attracting large SOEs to launch offshore initial public offerings (IPOs), the Hong Kong stock market becomes the best performer. In 2006, the Hong Kong market saw giant IPOs launched by Bank of China and the Industrial and Commercial Bank of China, while Singapore exchange is traditionally stronger in attracting manufacturers. By the end of 2008, over 800 overseas incorporated companies from Mainland China were listed on the different exchanges in either IPO or American Depository Receipt (ADR) forms. These include 456 on the Hong Kong Stock Exchange (H-shares and red-chips), 44 on the New York Stock Exchange, 76 on NASDAQ, 64 on the London Stock Exchange, and 150 on the Singapore Exchange, raising a total of US$112.157 billion. Meanwhile, 57 H-share companies had issued A-shares in the Chinese Mainland stock market (CSRC 2008).

1.2 Research Objectives

Given the fast development of Chinese cross-listing in the international stock markets as summarised in the previous section, Chinese cross-listing has been of particular interest to researchers. In spite of rich literature on cross-listing, conventional theories presented in previous studies may not adequately explain the phenomenon and behaviour of Chinese companies' cross-listing in the international stock markets that is being examined in this study.

First, most previous research on international cross-listing has focused on well-developed financial markets such as that of Canada, Japan, the United Kingdom (UK) and the United States (US). Most notably, the focus of the studies was on either US stocks cross-listed on an overseas exchange or foreign firms trading on US exchanges as ADRs (Karolyi 2006). As an emerging market, the study of Chinese cross-listing could enrich the literature of the global cross-listing phenomenon with a more complete dataset.

Secondly, the policies adopted in the well-developed stock markets and Chinese stock markets differ significantly. For example, the policies adopted in the stock markets of Hong Kong, the US and Singapore are free market-oriented. Hong Kong residents can hold Chinese B-shares and other foreign equities, but Chinese residents in Mainland China are not allowed to trade Hong Kong shares and other foreign shares, although hundreds of Chinese companies are listed in Hong Kong markets and other overseas

markets (Su 1999). This suggests that overseas listing is likely to have little impact on the domestic Chinese market because of such strict policy on capital flow (Forbes 2005). Meanwhile, short selling is not allowed in the Mainland Chinese market, while in the Hong Kong, Singapore, London and US markets, investors who are trading Chinese cross-listed securities should have the potential of being integrated in terms of the open and free trading environment with virtually complete access for foreign investors, and no regulatory constraints prevent cross-border arbitrage in cross-listed securities, and the markets are in fact actively arbitraged by institutional investors.

Regarding corporate governance issues, despite the challenges of an under-developed legal system, corporate governance standards for Chinese firms are often seen as either lacking or deficient in their operation (Liebman & Milhaupt 2008). Moreover, the overseas-listed Chinese firms are operating under Mainland China laws but with shares listed on the other stock exchange for example, London Stock Exchange, they must operate within and according to the rules of two significantly different systems. All these issues suggest that these cross-listed Chinese firms in international stock markets inevitably reflect the political, economic and social preoccupations of Mainland China, yet must simultaneously recognise and comply with the demands made by the host countries' legal system and securities markets.

Lastly, this research is the first study that explicitly examines Chinese cross-listings traded in several major stock exchanges. The examination of relationship between corporate governance and firm performance of Chinese listed firms through the angle of cross-listing has not been reported in the literature, and neither has the arbitrage strategy between the dual-listed Chinese firms. These represent important theoretical gaps that this thesis aims to fill.

Therefore, the research in this thesis has three objectives, as stated below:

1) To investigate the relationship of bonding hypothesis, corporate governance and firm performance of Chinese cross-listings. One of the issues of bonding hypothesis is that foreign firms incorporated in a jurisdiction with weak investor protection rights cross-list on US stock exchanges to legally bond themselves to higher disclosure standards and stricter enforcement, hence enhance the equity valuation (Coffee 1999, 2002). Liu and Kang (2007) surveyed 84 cross-listed Chinese firms, and they suggested that raising capital is the first important factor

for Chinese firms selecting the exchange, good governance ranked the fourth important factor to select an exchange. Protecting minority shareholder's interest as a bonding effect shows less importance. Therefore, in this study, the relationship between Chinese cross-listings and corporate governance under the bonding hypothesis will be examined.

2) To examine the interdependence relationship among different classes of shares of China that traded in different markets mainly in Hong Kong, the US, and the local A- and B-share markets in China. Prior studies that examined the interactions between China-related stocks mostly conducted on stock indices of each class of shares in Shanghai, Shenzhen and Hong Kong. However, the study of the relationship between China-related stocks by investigating the behaviour of individual stock prices and returns of classes of shares issued by the same company is meaningful and interesting.
3) To explore the cross-border arbitrage opportunities. Although short selling is restricted in Chinese markets, considering the market conditions of Hong Kong and the US, arbitrage opportunities could be found for the Chinese firms that are dual-listed on these two markets.

1.3 Thesis Structure

This thesis is organised into eight chapters. Chapter 1 describes the research background, the objective of the research, the thesis structure, and the contributions of the research. Chapter 2 introduces and examines the overall Chinese cross-listing phenomenon. Chapter 3 reviews the existing literature on cross-listing. The associated effects associated with cross-listing are reviewed with details.

The Chapters 4 to 6 report empirical test and findings. More specifically, Chapter 4 examines the relationship among the corporate governance, bonding hypothesis and firm performance; Chapter 5 examines the price relationship between the Chinese dual and triple cross-listings, cross-listings return behaviour, and market co-movement; and Chapter 6 explores the arbitrage opportunities for the Chinese dual-listed securities. For each of the issues under investigation, a conceptual framework is developed depicturing the hypothesised relationships between dependent and independent variables, which are then tested against empirical data investigate using various statistical techniques and procedures. Chapter 7 presents a small case study of one of Chinese cross-listing

companies from a multi-dimensional perspective. Chapter 8 concludes the study, lists the limitations of this research and suggests some of the future potential research.

1.4 Methodology

This study adopts different methodologies to examine the Chinese cross-listing issue, which includes three major quantitative empirical studies. Therefore a mixed method is suitable for this study because the study is of an exploratory nature in terms of the investigation of Chinese cross-listing phenomenon from different aspects. By adopting panel data analysis, the study provides an empirical test to the framework and hypotheses derived from bonding theory. The time series quantitative data collection and data analysis process for Chinese dual and triple-listings provides a detailed study of return and market linkage for Chinese cross-listing, which includes unit root test, cointegration analysis, Granger causality test and error correction models. Multivariate regression is also adopted to examine the market co-movement for Chinese dual-listed securities. Lastly, a simple daily arbitrage strategy is used to examine the statistic arbitrage opportunities for the dual-listed Chinese shares that traded both in the Hong Kong and New York markets. The results of these analyses are reported in the following chapters.

1.5 Contributions of the Research in the Thesis

This research builds on the existing literature on global cross-listing and makes the following original contributions to the body of knowledge in the area of cross-listing.

First, a great majority of the Chinese listed securities in two domestic stock markets and Hong Kong stock markets are converted from large SOEs. The government had a majority control of these listed firms, and the majority shares of these listed firms were not open for trade until 2006. Prior studies on the corporate governance and other related issues of Chinese listed firms were largely limited to this category (SOEs). The present study examines international cross-listed Chinese firms and extends the research from SOEs to the private Chinese firms and other small-medium-sized Chinese firms, which allows an understanding of whether encouraging Chinese firms to list overseas would help the Chinese government develop a robust, well-regulated securities market in China. The empirical study of the corporate governance and Chinese cross-listing

provides an implacable example for policy makers, market participants and corporate executives.

Secondly, previous theories, including agency theory (Jensen & Meckling 1976), property rights theory (Alchian & Demsetz 1972), the theory of incomplete contracts (Williamson 1975, 1985), and transaction costs (Williamson 1975, 1985) make different contributions on the corporate governance and the firm value within the country level. In the case of China, previous empirical work regarding the corporate governance issue has been focused on the effects of ownership structure on firm performance although with mixed results. This study applies bonding theory as the framework, examining the corporate governance issue through a different angle, which is beyond the border and in an international perspective.

Thirdly, most prior studies on Chinese overseas listing have focused on the A-share and H-share (Chinese securities listed on Hong Kong markets) markets. This study examines the Chinese securities cross-listed in multiple international locations. Besides Hong Kong and the US, Singapore and London are also included. Notably, there has been limited research reported on triple cross-listings between developed and emerging markets, and most of the prior studies have been conducted based on the pair-wise analysis for cross-listings and the adoption of indices to represent the individual share behaviour. It is expected that this research will bridge the gap by providing insights into the relationship among Chinese cross-listings under different market environment conditions and extend the existing literature on international financial markets and cross-listing. It is also necessary to further investigate the arbitrage strategy for Chinese ADRs and underlying securities in multiple markets. Moreover, this study provides a database and the framework that will permit further research and analysis into more specific issues on Chinese cross-listings.

Lastly, the findings in this study reveal some important practical implications for directors and managers of Chinese enterprises who have their securities listed overseas or who are interested in cross-listing in the future, and for policy makers considering further reform and the development of the Chinese stock markets. Copying the corporate governance mechanisms from developed countries or passively adopting the requirements of the host market is not an ideal approach. For example, this study shows that the independent director practice does not work effectively for firms listed in China. The expanded board size of Chinese firms listed in Hong Kong stock markets appears to

create an overlapped effect. The management of firms should be aware of the inefficiency caused by passively adopting the corporate governance practice required by the host stock exchange. Another important implication is the portfolio of international diversification of securities when acquiring the securities from the emerging market like China; if the securities traded on these markets are not cointegrated, international diversification among these assets is effective. Lastly, the Chinese policy-makers are currently discussing the application of a so-called ‘arbitrage mechanism’ to eliminate the price spread for the dual-listed Chinese securities (Chang & Ren 2009). However, no such mechanism can effectively ‘arbitrage away’ the price difference between the dual- and triple-listed securities. This study will help Chinese market participants to better understand market segmentation, and the limits and risks of arbitrage strategy.

Chapter 2: Chinese Cross-Listing

2.1 China Stock Market History

For more than 30 years, since the foundation of the People's Republic of China in 1949, China had gone through the centrally planned economy, in which all enterprises were state owned or collectively owned and all investments were centrally planned and funded by government, as well as by loans from the state-owned mono-bank system (Wong, 2006). In December 1978, under the leadership of Deng Xiao Ping, the Chinese government launched the Open Door Policy calling for economic reform[1]. China has since begun the process of transforming its economic system from centrally planned to a more marked oriented economic system, while retaining the overall control of the Chinese Communist Party in the country. The economic reform and open-door policy gradually lead to the re-establishment of the stock markets in China in 1990 (Field, 1984).

The stock market history in China can be traced back to nineteenth century when the first and original securities market was established in Shanghai. Following the First Opium War, the Treaty of Nanking in 1842 established an area in Shanghai known as the International Settlement. This development prompted the emergence of foreign markets in the area, and culminated in the introduction of securities trading in the late 1860s. In June 1866, the first share list began to appear, prompting a number of banks to form a legal framework for joint-stock companies. This was coupled by an interest in diversification for investors and trading houses (although the trading houses themselves remained partnerships). 1880s saw the Chinese mining industry booming. In 1891, the Shanghai Sharebrokers' Association was established, creating China's first stock exchange. Most of the shares were supplied by local companies, and banks took the opportunity to dominate the majority of the private shares. By the turn of the century, Hong Kong and Shanghai banks had consolidated the majority of the trading shares from foreign bases. In 1904, the Association moved to establish another exchange in Hong Kong, expanding the grip of the Chinese market in the world economy. In 1920, in response to the development of a modern financial market in Shanghai, the Shanghai

[1] The economic reform was announced at the Third Plenum of the Eleventh Central Committee in December 1978.

Stock and Commodities Exchange was formally established (Ji, 2002). This was followed the next year by the Shanghai Chinese Merchant Exchange. In 1929 the markets combined and officially formed the Shanghai Stock Market. Rubber became one of the prime stocks at the same time as a number of foreign companies, such as those from Japan, began to consolidate their economic control of the Chinese Stock Market. In 1941, the Japanese military took control of Shanghai and the stock market ceased operation (Ji, 2002). After the Chinese Communists Party took over the power in China in 1949, all of the markets, including native banks and private model banks, were officially closed, as the Communist Party saw this as one of the symbols of capitalism, which did not fit for China's new economic development path (centrally planned economy) (Ji, 2002).

Following the introduction of economic reforms in December 1978, some local Chinese government started experimenting with selling shares of SOEs directly to domestic individuals in order to raise equity capital as part of enterprise reforms in the late 1980s (Wong, 2006). Curbed trading and a black market were formed followed by the establishment of Over the Counter (OTC) trading systems in a way of more organized but less formal exchanges. In 1990, the Shanghai and Shenzhen exchanges were opened with formal approvals of the central Chinese government. Since then, the Chinese government has introduced a series of policies in an attempt to develop its underdeveloped stock markets (Swanson and Lin, 2008).

2.2 China Cross-Listing

2.2.1 China Cross-listing Background

The creation of China stock markets follows a political rather than an economic logic. The decision makers shape the stock markets in a politically-motivated way rather than a market-oriented way (Cooper, 2002). Under this situation, the excessive government control could be seen everywhere, especially in these China stock markets. For example, to prevent cash-starved and poor quality SOEs flooding into the stock market, the Chinese government adopt the IPOs quota system under the supervision of the State Planning Committee, the Central Bank, and CSRC, who would determine the quantity of equity to be issued each year; the quota was then distributed among the various provinces and eligible central government departments (e.g. Ministries) (Chen et al., 2001).

However, this quota system prevents many large companies and the companies with high growth potential from getting listed. After the open-door policy in 1979 of China[2], more and more small and medium sized Chinese private enterprises emerged. But, comparing with the SOEs, those small and medium sized Chinese private enterprises lacked needed funding, which to some extent prevents them from achieving fast growth. China's commercial banking system has not evolved sufficiently to serve these groups of companies' need for funding. Historically, the big four state-owned commercial banks favour lending to SOEs rather than private enterprises. Therefore, these private Chinese firms have to finance their own growth with their own reserved funds. The re-establishment of the stock market in China has seemingly provided an alternative source of finance to this group of firms, yet they have to queue for many years in order to get listed on one of China's two domestic stock exchanges. To a large extent, the Chinese stock exchanges are almost out of reach to small and medium sized private firms, although they are liquid and large in size. This is even so for some of the already restructured Chinese SOEs. By March 1998, there was only one non-state owned company - Sichuan New Hope Agriculture Stock Co., Ltd. gained the permission to list from the Chinese government and became the first listed private enterprise. Under this circumstance, the CSRC found that overseas-listing could be another channel to solve the problem. Therefore, in March 2000, the CSRC gave up the IPOs quota allocation system (Wong, 2006)

2.2.2 History of China Cross-listing

2.2.2.1 Back-Door Listing

The first wave of Mainland Chinese firms listed abroad occurred in Hong Kong in the 1980s. During that time, the central Chinese government ministries and provincial/municipal governments were eager to establish a financial base in Hong Kong before the Chinese stock markets officially re-established (De Jonge, 2008). As we have noted, and the Open Door Policy has brought about China's integration into the global economy, especially a higher level of integration between the Mainland China and Hong Kong economies[3]. In 1980s, the provincial and municipal governments were

[2] The economic reform was announced in December 1978, but the indication of the open-door policy was in 1979 after the first joint venture law introduced in April 1979.

[3] Six years after Deng Xiao Ping led Chinese government announced the open door policy in 1978, Margaret Thatcher signed the bilateral treaty by which Britain agreed to return the Hong Kong territory to Chinese control. Ever since then, Hong Kong has developed an ever-closer partnership with Mainland China. And the handover on 1 July 1997 makes the linkages between these two economies become indissoluble.

the main players in relation to listing in the Hong Kong Stock Exchange. Before the Chinese firms could be officially allowed to list directly on the Hong Kong Stock Exchange, they must have been already having significant back-door listing cases. This back-door listing involves a Hong Kong company being taken over by a Mainland China holding company that is controlled by a central government ministry or provincial/municipal government. Generally, this takeover target is a Hong Kong shelf company or a company that is in financial distress. After the takeover, the Mainland China company injects capital into this Hong Kong 'shell' company, and the Hong Kong 'shell' company is then used as a listing vehicle by the Mainland China parent (Su, 2003). These Mainland–controlled and Hong Kong-incorporated companies are now known as 'red-chips'. For example, China Travel was founded in 1927 and now operates under the State Council. The company listed its own subsidiary in Hong Kong in 1992 under the name China Travel International Investment Hong Kong Ltd. This Hong Kong subsidiary, China Travel Service (Holdings) HK Ltd was founded in 1985.

The Tiananmen Square incident in June 1989 cooled down the international enthusiasm for red-chips. But Deng Xiao Ping's Southern Tour in 1992 led to a China-related stocks revival. Between 1992 and 1993, the Chinese central government dominated the back-door listings with more than 15 red-chip investment vehicles created. Also, historically, in 1992 the central government's exertion of power and influence under Deng Xiao Ping's leadership was at a high point. Therefore, the year of 1992 becomes a year which the Mainland authorities took measures to assert control over the red-chip listings by establishing a centralized approval mechanism for all Hong Kong listings by Chinese subsidiaries. The year of 1992 also witnessed official communications being established between the Hong Kong Stock Exchange and the Mainland Regulatory authorities to discuss the direct listing of China-based companies, instead of via Hong Kong-incorporated listing vehicles (Niu, 1997).

The takeover of a shelf company to achieve a back-door listing in Hong Kong was accompanied by the outflow of assets from the mainland China. The Chinese central government quickly became concerned about this outflow of the country's assets and took a further step by allowing direct listings on overseas exchanges as an alternative venue for raising foreign capital for Mainland-incorporated SOEs. Hong Kong then became the first and most popular foreign exchange accessed by mainland Chinese companies.

2.2.2.2 Early Stage Listing in Hong Kong and the USA

In September 1992, the State Council of China published its list of nine SOEs selected to be the first ever to issue H-share equities. The first H-shares, issued by Tsingtao Brewery Company, were opened for offer in the Hong Kong market on 29th June, 1993, and began trading on the Hong Kong Stock Exchange on 15th July, 1993. But the Chinese government initially refused to allow primary listings to proceed in New York, London or any other place outside of China apart from Hong Kong. The government believed that the Hong Kong market for China-based issues should be developed before proceeding further. Therefore, the primary listing became one single offering, which took place in three parts: a share sale in Hong Kong, a public sale of ADRs in the United States, and a sale of Global Depository Receipts (GDRs) outside the United States (De Jonge, 2008).

At the early stage of cross-listing, the Chinese government was aware that due to the poor infrastructure of the local capital market, it was better to list those SOEs that are large in capital scale and perform reasonably well on Hong Kong and New York Stock Exchanges rather than listing domestically. Generally, these SOEs listed in Hong Kong and New York in 1990s were the ones that have been strong performing and have previously preferred the prestige and fund-raising potential of listing-abroad. These companies are regarded as being the "best of the best" (Huang and Song, 2005). Effective from 2005, any Chinese company wishing to list overseas is also required to list locally. For example, China Mobile, and Aluminum Corporation of China were listed back on the Shanghai Stock Exchange in 2007.

2.2.2.3 Recent Trend

Over the last few years we have seen significant changes in the stock exchange landscape globally. Several major key players of the stock exchanges are trying to focus on new sources of profits and winning business outside the home market. They are tripping over each other in China to tout the advantages of listing abroad to Chinese companies and regulators. (Kang, 2008). In China's case, few of the private Chinese companies can resort to raising new money from local equity markets because of a long queue to list on the two main Chinese bourses. Meanwhile, the Chinese government recognizes the needs of Chinese companies to raise share capital and generally does not stand in the way of private firms that seek to tap into the world's capital markets.

Therefore, under this circumstance, these small to medium-sized Chinese companies finally have their time to be listed on stock exchanges, but only with the permission from the Chinese government.

In recent years, Chinese firms have been dominating the worldwide IPOs, notably for the world's biggest IPO by the Industrial and Commercial Bank of China Ltd. in October 2006, who raised a total amount of US$21.9 billion. However, Hong Kong dominates both in terms of Chinese listing numbers and issuing size. Most of these Chinese shares traded in USA are registered with the U.S. Securities and Exchange Commission and traded as ADRs. The early ADRs traded in the New York Stock Exchange also have underlying shares listed and traded in the Hong Kong Stock Exchange. For the characteristics of the Chinese companies related to the host stock exchange, Hong Kong and New York Stock Exchanges attract the Chinese monopolized companies in the field of natural resources, banks, and telecoms. NASDAQ gathered Chinese IT, dot com companies and pharmaceutical companies. Singapore appears to be more attractive to industrial, food and retailing Chinese companies.

2.2.3 Location of Chinese Cross-listing

The last decade witnessed a more diversified listing location for Chinese firms. Besides the Hong Kong Stock Exchange and the New York Stock Exchange as popular locations for Chinese cross-listing, London AIM, NASDAQ and Singapore have attract more and more Chinese firms to list, especially the small to medium sized private Chinese firms. For example, among the nearly 100 overseas Chinese listings in 2006, these Chinese private firms accounted for 87 per cent to list in Singapore and Hong Kong[4]. Those smaller Chinese firms have traditionally looked to the Hong Kong and Singapore markets, but there are too many Chinese firms looking to list for those bourses to satisfy demand. And a greater number of them do not fulfil the profitability/track record requirements of the existing market and are therefore unable to obtain a listing. Therefore, Hong Kong Growth and Enterprise Market (GEM) and London AIM, which removed the entry barrier, enabling growth enterprises to capitalize on the growth opportunity of the region by raising expansion capital under a well-established market and regulatory infrastructure, become the hot destinations for these Chinese firms. AIM has been incredibly successful in attracting the listings of, and

[4] 23 May, 2007 China Security Paper

raising money for, international small-cap growth companies in recent years and it is natural that Chinese companies now seek funding on AIM. But GEM never took off because it failed to attract sufficient quality companies or institutional investors. Meanwhile, listing in AIM, HK GEM and Singapore avoids the costs of complying with the U.S. Securities and Exchange Commission (SEC) and Sarbanes-Oxley requirements, which some companies find increasingly burdensome. But generally speaking, AIM, Hong Kong GEM and Singapore failed to attract quality Chinese companies.

Besides the stock exchanges mentioned above, several other stock exchanges have also become the listing destinations for Chinese firms. For example, Shangdong Gongyou Machines Limited becomes the first Mainland Chinese enterprise listed in the Frankfurt Stock Exchange. So far, there are total of 14 Chinese firms listed on the stock exchange of Frankfurt by the end of 2008. Meanwhile, on the 26th April 2007 Asian Media becomes the first Chinese firm listed in the Tokyo Stock Exchange. The Korean Stock Exchange also approved the listing request for China Huafeng Textile Group on the 1st June 2007. Besides the more diversified listing destinations, the Chinese cross-listing phenomenon also becomes a mutual interaction between the Chinese companies and overseas stock exchanges. On the 3rd December 2007, NASDAQ set up their China headquarters office in Beijing. Later, on the 11th December 2007, the New York Stock Exchange also opened their office in Beijing. It is reported that the London Stock Exchange and the Korean Stock Exchange are going to have their office in China soon. So far, there are a total of nine foreign exchanges that have representative offices in China[5] (Xinhua News Agency).

Since the first cross-listing of Chinese companies in Hong Kong was announced on October 24 1992, and as of December 2008, there are 513 Chinese cross-listings including the dual or triple cross-listings on the major stock exchanges internationally. Table 2.1 is a summary of the distributions of these Chinese cross-listings in various stock exchanges. It demonstrates that the location choice of Chinese cross-listings have experienced two different trends in two different phases. The first phase occurred during the period of 1990-2000 where most of the cross-listings were located in the Hong Kong Mainboard market and only a limited number of Chinese companies were listed in New York and Singapore. Notably, even those Chinese listings in New York are also

[5] The foreign exchanges with representative offices in China are: Hong Kong Stock Exchange, New York Stock Exchange, NASDAQ, Tokyo Stock Exchange, Korea Exchange, Singapore Exchange, London Stock Exchange, and Deutsche BÖrse Group.

Table 2.1: Chinese Overseas Listings Cross Markets by Year 1992-2008

This table provides summary statistics of Chinese firms listed in different stock exchanges by years.

	Local Markets		**Overseas Markets**														
	Mainland China		**Hong Kong**			**United Kindom**			**USA**						**Germany**	**Singapore**	**Total**
	A	B	HK Mainboard	HK GEM	***Sub-total***	London SE	London AIM	***Sub-total***	AMEX	NYSE	NASDAQ	144A	OTC	***Sub-total***	Frankfurt	Singapore	**Cross-listings**
1990	8																
1991	5																
1992	40	18															**0**
1993	124	23	6		***6***					1		1	1	***3***			**9**
1994	110	17	8		***8***					1		5	2	***8***		1	**17**
1995	24	12	1		***1***							1	3	***4***		1	**6**
1996	203	15	6		***6***					1		1	4	***6***		1	**13**
1997	206	16	15		***15***	3	1	***4***	1	3		1		***5***		1	**25**
1998	106	5	2		***2***			***0***		1	1			***2***		2	**6**
1999	98	2	3		***3***								1	***1***		5	**9**
2000	136	6	3	3	***6***	2		***2***	1	3	1			***5***		1	**14**
2001	79		3	4	***7***					2	1		1	***4***		4	**15**
2002	71		4	11	***15***		1	***1***		1			5	***6***			**22**
2003	67		10	8	***18***				2	1	1		2	***6***		13	**37**
2004	100		8	8	***16***	1	4	***5***		2	8	1	4	***15***		30	**66**
2005	15		9	3	***12***		7	***7***		2	8		2	***12***		23	**54**
2006	66		17	3	***20***		24	***24***		4	2		4	***10***		24	**78**
2007	126		9		***9***		15	***15***	2	19	10	1	1	***33***	7	27	**91**
2008	77		6	1	***7***		4	***4***		3	1	1	24	***29***	7	4	**51**
Total	**1661**	**114**	**110**	**41**	***151***	**6**	**56**	***62***	***6***	**44**	**33**	**12**	**54**	***149***	**14**	**137**	**513**

Sources: Information of Chinese companies listed in China A and B markets are obtained from CSMAR database.
Information of Chinese companies listed in USA, London AIM, Singapore, and Frankfurt are obtained from the stock exchange website respectively.

dual-listed in the Hong Kong Stock Exchanges. Starting from 2001, the cross-listing phenomenon for Chinese firms has been accelerated with more location choices, which could be labelled as the second phase. London AIM, Hong Kong GEM, and NASDAQ have become attractive listing locations for Chinese firms. Meanwhile, the listing numbers in Singapore have been greatly increasing, starting from the second phase of the cross-listing. And, since then, there has been no more Chinese companies issued B-shares in the China B market. More specific data on the Chinese cross-listing companies are presented in Appendix 1.

2.2.4 Modes of Chinese Cross-listing

With more and more Chinese private firms going public in international markets, how to list internationally becomes another characteristic for the listing modes of Chinese private firms, especially for those who don't have the resources or profits for a splashy initial public offering. There are three major overseas listing modes that a Chinese firm can choose from. The first mode is primary listing. The primary listing involves restructuring the current company, setting up a holding company in Mainland China, getting the approval from the local government and the overseas stock exchange, finding the lawyers, registered accountants and banks, auditing, and lodging the files to apply for listing on the stock exchange. And compared to most of the Chinese private firms, this whole public process is complicated with high costs, regulatory barriers and extensive time commitments. However, most of the SOEs would not worry about the listing expenses related to the primary listing. These Chinese companies have explicit goals to choose direct IPOs process when looking to get a Hong Kong or U.S. stock listing.

The second mode is termed reverse merger. The reverse merger mode makes the overseas-listing process faster and less onerous than the primary listing model or IPO. This listing mode has been adopted greatly by Chinese private firms. With this mode of listing, a Chinese firm is acquired by a U.S. or an international shell company, and this company could be worth nothing, which is publicly traded. The buying company pays for the acquisition target with the shares. When the transaction is closed, the target company receives enough stocks to have the controlling ownership of the company that "acquired" it. Then, the board of this shell company resigns and the Chinese board takes over, changes the name of the company, and issues new security to hedge funds or other

new investors, raising millions of dollars. And this process only takes a few months. One of the successful Chinese companies that adopted this mode and got to list in the USA successfully is Sinovac Biotech Ltd, a China Beijing-based vaccines maker that has raised $12 million capital in 2003. According to the Reverse Merger Report that with more than 20 per cent involved foreign companies seeking US listings, Chinese companies accounted for 60 per cent of the foreign deals in 2006 (Dolbeck, 2006).

The third overseas listing mode is merger & acquisition. This mode involves setting up an investing company offshore. The offshore company registration locations for most of the Chinese private firms are the Cayman Island, Bermuda, Bahamas, the British Virgin Island, and the Bahamas, where tax exemption benefits are accessible. This offshore investing company should have some degree of ownership control of the Chinese domestic company. Then a target company is chosen to issue the new shares and merge with the capital of the China domestic company. Therefore, the China domestic company doesn't need to pay the cash to acquire its shares, and the prior controlling shareholder is kept.

But no matter which overseas-listing mode the Chinese firm chooses, these Chinese firms have substantial operation activities in China, and are also incorporated in the Cayman Islands or other tax-exempt locations, and problems occur sometimes. Unlike in the United States, where many relevant jurisdictions are effective in place, the Cayman Islands and other tax-exemption countries' laws do not specifically provide for shareholder appraisal rights on a merger or consolidation of a company. This may make it even more difficult to assess the value of any consideration shareholders may receive in a merger or consolidation if the shareholders believe the consideration offered is insufficient. For example, most of the company directors and officers reside outside the country of the host stock exchange and consequently so do the assets of those company personnel. As a result, it may be difficult or impossible for the shareholders to bring an action against the listed company or these individuals in China or in the country where the company is incorporated in the event that the shareholders believe that their rights have been infringed under the applicable securities laws or otherwise. Even if the shareholders are successful in bringing an action of this kind, the laws of the Cayman Islands or other tax-exemption country and of China may render them unable to enforce a judgment against the assets or the assets of the directors and officers. Further, shareholders of the Cayman Islands exempted companies have no general rights under

Cayman Islands law to inspect corporate records and accounts or to obtain copies of lists of shareholders of these companies. The directors have discretion under their articles of association to determine whether or not, and under what conditions, their corporate records may be inspected by shareholders, but are not obliged to make them available to shareholders. This may make it more difficult for the shareholders to obtain the information needed to establish any facts necessary for a shareholder motion or to solicit proxies from other shareholders in connection with a proxy contest. Therefore, public shareholders may find it even more difficult in protecting their interests in the face of actions taken by management and members of the board of directors or controlling shareholders of a Chinese listed company than a U.S. company.

2.2.5 Chinese Share Classes

A "split-share" system has existed in the Chinese stock market since the re-establishment of the stock market in the early 1990s, which allows Chinese companies to issue different classes of shares to domestic and foreign investors. The classes of shares include A-share, B-share, H-share, L-share, N-share, S-share, T-share, Red-chip, and ST-share. A summary of the major types of shares are illustrated in Table 2.2.

Table 2.2: Listed Chinese Companies Share Types

Type of Shares	Description
A-share	Domestically listed shares, denominated in RMB currency. Foreign investors may excluded by these shares.
B-share	Domestically listed shares of China-incorporated companies, which denominated in US dollar in Shanghai and HK dollar in Shenzhen.
H-share	Shares of Mainland China registered companies listed in Hong Kong.
Red-chips	Shares of companies registered overseas and listed abroad (principally in Hong Kong) which have strong connection with Chinese government.
ST share	Stocks that have financial or other abnormalities and have the potential to be terminated from stock exchange.
Other-share	Overseas listed shares, denominated in local currency.

The A-shares, which were available to local investors, are denominated in Renminbi (RMB), not freely convertible to international currencies, and are traded in the Shanghai and Shenzhen stock exchanges. Since November 2002, Qualified Foreign Institutional Investors (QFIIs), such as large banks, funds, and securities companies with at least $10 billion in management, have been allowed to buy up to 10 per cent of a company's shares (still held in Chinese currency) (Ni, 2009).

B-shares were first created in early 1991 to be sold solely to foreign investors using foreign currency. The B-share market was driven by the idea that foreigners eager to invest in China were at first willing to pay more per share than their domestic counterparts. B-shares are denominated in Hong Kong dollars on the Shenzhen Stock Exchange and US dollars on the Shanghai Stock Exchange. The demand for B-shares has been significantly lower than A-shares, the long-term performance of the B-share market has lagged far behind the A-share market, even when a company issues both A- and B-shares with identical voting and dividend rights. Since no arbitrage trades are possible between these two types of shares, the A- and B-shares of the same company are traded at different prices.

Red-chip is defined as a Mainland China based company that is incorporated internationally and listed on the Hong Kong Stock Exchange. The business of the company is based and operated in Mainland China, and is usually controlled by shareholders in Mainland China. A red-chip company is a company that has at least 30 per cent of its shares in aggregate held directly by Mainland China entities, or indirectly through companies controlled by them, with the Mainland China entities being the single largest shareholders in aggregate terms. Alternatively, a company would be considered a red-chip company if less than 30 per cent, but more than 20 per cent, of its shares are held directly or indirectly by Mainland China entities, and there is a strong influential presence of Mainland China-linked individuals on the company's board of directors. Mainland China entities include SOEs, and entities controlled by provincial and municipal authorities. Normally, these companies have strong connection with the government. The word ‘red’ represents the Peoples’ Republic of China and the Chinese Communist Party (De Jonge, 2008).

H-share refers to the situation where a company is incorporated in Mainland China but its shares are traded on the Hong Kong Stock Exchange. These are essentially the shares of Mainland Chinese companies registered in Hong Kong and traded on the Hong Kong Stock Exchange, denominated in Hong Kong Dollars. When a Chinese firm pursues an international listing, it would first need to get an approval from the Chinese government. Generally, the companies that are listed in Hong Kong have been strong companies selected in part to showcase Chinese companies on the international stage, and a significant number of them are China's best A-list companies that have previously

preferred the prestige and fund-raising potential of listing abroad. The H-shares are available to all foreigners.

The N-share refers to the shares of Chinese companies listed in either the New York Stock Exchange or the NASDAQ. Like H-shares, most of these listed companies are considered the strongest Chinese companies, and are selected by the Chinese government and registered with the U.S. Securities and Exchange Commission and trade their shares in the United States at the early stage. These companies are regarded as being the “best of the best”, in that they are strong and profitable Chinese companies. The shares are traded as ADRs, which is seen to be an easy way for an American citizen to invest in a foreign company. Since July 2006, the local institutions that are a member of the Qualified Domestic Institutional Investors (DQIIs) program can buy shares from international exchanges (Ni, 2009).

A number of types of shares are named in line with their listing locations. For examples, shares of Chinese companies that are listed on the Singapore exchange are known as S-shares. L-shares are the shares listed on the London Stock Exchange or the AIM board in London and T-shares are the shares listed on the Tokyo Stock Exchange. A foreign investor looking to invest in China has thus a number of alternatives. They may be prohibited from buying A-shares in a company listed in China, but could buy B-, H-, L-, N-, T-, or S-shares in the same company. Interestingly, Chinese domestic investors bear the brunt of the risk in China's developing market since they can invest only at home while most foreigners are off that limit.

Lastly, a distinctive class of shares is called Special Treatment (ST) or *ST. ST and *ST is the ticker symbol to differentiate these stocks from other Chinese stocks traded in the stock market. The listed companies that are attached with this ticker symbol are the companies that in situations where financial and other abnormalities may lead to the termination of the company’s status make it difficult for investors to judge the company’s outlook or may have a negative impact on the investor’s interests. The securities exchanges then assign Special Treatment to such a stock, including the issuance of a warning for delisting risk and other special arrangements.

2.2.6 Chinese ADRs

An ADR is a stock that trades in the United States but represents a specified number of shares in a foreign corporation, and it was introduced to the financial markets in 1927 as a result of the complexities involved in buying shares in foreign countries and the difficulties associated with trading at different prices and currency values (Amary and Ottoni, 2006). ADRs are bought and sold on American markets just like regular stocks, and are issued/sponsored in the U.S. by a bank or brokerage. For this reason, U.S. banks simply purchase a bulk lot of shares from the company, bundle the shares into groups, and reissue them on the New York Stock Exchange, the American Stock Exchange or the NASDAQ. In return, the foreign company must provide detailed financial information to the sponsor bank. The depositary bank sets the ratio of U.S. ADRs per home-country share. This ratio can be anything less than or greater than 1. This is done because the banks wish to price an ADR high enough to show substantial value, yet low enough to make it affordable for individual investors. Most investors try to avoid investing in penny stocks, and many would shy away from a company trading for 50 Russian roubles per share, which equates to US$1.50 per share. As a result, the majority of ADRs range between $10 and $100 per share (ADRtraders.com). If, in the home country, the shares were worth considerably less, then each ADR would represent several real shares.

There are four different types of ADR issues (Source: ADR Reference Guide - JPMorgan, February 2006):

- Level 1 – Trading on the non-NASDAQ OTC. This is the most basic type of ADR where foreign companies either don't qualify or don't wish to have their ADR listed on an exchange. Level 1 ADRs are found in the over-the-counter market and are an easy and inexpensive way to gauge interest for its securities in North America. Level 1 ADRs also have the least restrictive requirements from the Securities and Exchange Commission.
- Level 2 – Level 2 issues involve trading shares on NASDAQ, the American Stock Exchange, and the New York Stock Exchange, but cannot be sold as a public offering. Meanwhile, the issuers are required to comply with strict disclosure requirements.
- Level 3 – On Level 3, new equity capital is raised. ADRs can be listed on one or more U.S. exchanges and are registered with the Securities and Exchange

Commission for public offer to U.S. investors. In addition to the requirement of a Level 2 issues, a prospectus must be prepared and additional SEC disclosure requirements must be met as well. Chinese firms that list in New York typically trade in Level 3 American Depository Receipts.

- Level 4 -Private Placement Rule 144A ADR Programs. The issue of this level was established for the private placement of new shares with minimal disclosure requirements and is restricted to qualified institutional buyers.

The DR ratio is individual to each company. That is, companies trade in ADRs that are packaged at a ratio of one ADR to the number of underlying shares in the package. For example, in a 1:100 ADR, each depository receipt corresponds to 100 shares of the company (NYSE, 2007). The ratio depends on the underlying value of the individual shares. The receipts are then listed in the US by the issuing institution, and they are traded as if they were actual shares of the foreign company.

Chinese securities listed in US markets mostly take the form of type 3 of ADRs, which are listed and traded in the New York Stock Exchange, NASDAQ, OTC and the American Stock Exchange. Appendixes 1.1 to 1.4 provide detailed information on the ADR ratio of Chinese listed companies.

2.2.7 China Cross-listing and Market Cooperation

The establishment of a B-share market and other Chinese shares listed internationally have allowed foreign investors to make alternative investments and also enabled those Chinese firms to raise foreign capital, improve corporate governance and manage risks. But to list in international markets requires an extensive list of approvals and is tightly controlled by the Chinese government (Walter and Howie, 2006). Since 1995 (five years after the re-building of the stock market) the Chinese government introduced several rules regarding the issuing B-share, H-share, and other shares in foreign markets. Therefore, to facilitate the inflow of foreign capital, one Chinese firm must satisfy the requirements stated in the securities regulations, and meet the following conditions: It must have obtained approval from the relevant authorities for its use of foreign investment, or for its conversion into a foreign-funded enterprise. It must have a stable source of adequate foreign exchange income, and the total amount of its annual foreign exchange income must be sufficient to pay the annual dividends. The proportion of B-

shares to the total number of shares must not exceed the ceiling determined by the relevant authority. The aggregate amount of shares to be issued is fixed in each year, and the total number of firms allowed to issue foreign shares is also limited (De Jonge, 2008).

The CSRC has actively participated in multilateral and bilateral consultations and dialogues at international level and regional levels to improve the cooperation with overseas securities regulators, international organizations and government agencies. Signing bilateral memoranda of understandings (MOUs) is one of the major means to strengthen regulatory cooperation with international peers. By the end of 2008, CSRC has assigned 43 MOUs with regulators in 39 jurisdictions. For example, there is the Chinese-Hong Kong Memorandum of Regulatory Co-operation on the Regulation of Mainland Enterprises Listed in Hong Kong that was signed on 19 June 1993. An important outcome of this negotiation was the introduction of Mandatory Provisions to be included in the Articles of Association of all Hong Kong-listed mainland companies. These Mandatory Provisions resulted from joint efforts by the Hong Kong Securities Commission and the State Restructuring Commission of the People's Republic of China to bring corporate governance standards within Hong Kong-listed mainland firms more into line with those prevailing in other Hong Kong listed firms. In Hong Kong, the Mandatory Provisions are required under, and supplemented by, the Hong Kong Stock Exchange listing Rules. In Mainland China, they are enforced through, and supplemented by, the *Special Regulations of the State Council concerning Floating and Listing of Shares Overseas by Companies Limited by Shares* and the *Notice on the Implementation of Essential Clauses in Articles of Association of Companies Listed Overseas*. Since 1993, the Mandatory Provisions have ensured that all H-share firms have certain binding clauses in their Articles of Association which serve to subject directors, supervisors, and senior management to a number of important fiduciary duties owned to the company and its shareholders (De Jonge, 2008).

The cross-listed Chinese firms are required to adopt an international accounting standard (IAS), which differentiates the cross-listed Chinese firms from the pure locally listed Chinese firms (Article 36, Operating Rules on Issuing B-shares by Joint Stock Limited Companies). For those dual-listed Chinese firms, they need to maintain a dual reporting system and auditing of IAS-based disclosures. The CSRC also requires that IAS-based disclosures be audited by international auditing firms, whereas Chinese

Generally Accepted Accounting Principles (GAAP)-based disclosures are audited by locally certified accountants. These special provisions might pressure the B-share companies to observe and to conform to international governance standards more closely. For Chinese listings in the Hong Kong market, a sufficient management presence in Hong Kong must be present based on the Hong Kong regulation. Besides this, the board of directors must include at least two independent non-executive directors who have the character, integrity, independence, and experience necessary to fulfill their role on the board. The investor protection provisions equivalent to those given in the laws of Hong Kong must be included in the H-share companies' constitutional documents (Hong Kong Stock Exchange). In the Singapore market, annual reports could be conducted in accordance with Singapore Financial Reporting Standards (SFRS). But the financial statement conducted in accordance with International Financial Reporting Standards (IFRS) or U.S. GAAP need not be reconciled to SFRS (Singapore Stock Exchange).

2.3 Conclusion

The above sections present a broad picture of the history of the China stock markets, the characteristics of the Chinese shares, and the reason that cause Chinese firms to cross border list their shares. These reasons could be the driving force by the government, or could be the self-growth needs by the Chinese company itself. But the procedure for Chinese companies to get publicly listed at home, however, still remains complex and strictly controlled (Wei and Kang, 2009). Although it is not hard to get listed in international markets nowadays, these overseas-listed Chinese firms would face more challenges by meeting the rules and regulations under two different legal and market systems. High level and complicated government regulations, policies, and rules make cross-listing a complicated process for Chinese firms to list and trade in the international stock markets. Therefore, investigation into the Chinese cross-listing would be interesting and important as the phenomenon seems to be inconsistent with existing lines of literature. Due to the data availability, this study will restrict the Chinese dual and triple listings that traded in Hong Kong, New York, NASDAQ, London, and Singapore markets.

Chapter 3: Review of Cross-listing

3.1 Introduction

Technological progress and the liberalisation of capital market policies greatly facilitate the capital market internationalisation and mitigate market segmentation. The first wave of internationalisation of markets began during the 1970s with investors and firms investing funds in foreign equity markets to diversify their portfolios and earn higher returns than were possible with only a domestic portfolio (Foerster & Karolyi 1993). Then, another globalisation phenomenon saw firms actually cross-listing their stocks on foreign capital markets in the early 1980s.

During the 1990s, the number of foreign companies with shares cross-listed and trading on major exchanges outside of their home markets reached as high as 4,700 and included among their numbers were not only companies from developed economies, but also many from emerging economies opening up their stock markets to foreign investors for the first time (Karolyi 2006). However, the past years have witnessed a significant slowdown in the pace of new international cross-listings and in the fraction of global trading on overseas exchanges. From May 2007 to May 2008, 35 large European companies, including household names such as Ahold, Air France, Bayer, British Airways, Danone and Fiat, terminated their cross-listings on stock exchanges in New York as the requirements for deregistering from US markets became less stringent. On the Tokyo Stock Exchange, too, some well-known companies, such as Boeing and BP, have recently withdrawn their listings (Dobbs & Goedhart 2008). By the end of 2008, the overall foreign listing in world exchanges decreased to 3,046 (World Federation of Exchanges 2008). London, NASDAQ, New York and Singapore still attract the most foreign company listings.

The long-held conventional wisdom of cross-listing has been challenged. During the 1990s, a great body of literature, both theoretical and empirical, has examined the issue of cross-listing, seeking to understand the net benefits of the corporate decision to list shares on overseas exchanges. Similarly, there have been a dozens of new academic studies of the benefits and costs of listings that depart from the conventional wisdom of previous studies and that seek to rationalise the changing and now more complex world

of cross-listings.[6] These studies extend our understanding of the cross-listing from different angles, and mainly focused on three aspects: (i) corporate governance and legal bonding; (ii) multiple listing and informed trading, price discovery and information transmission, and (iii) arbitrage.

The purpose of this chapter is to provide an extensive literature review on cross-listing and its new research initiatives of corporate issues within past years.

3.2 Corporate Governance and Legal Bonding

Firms cross-list for a number of reasons, including lowing the cost of the capital (Stapleton & Subrahmanyam 1977; Errunza & Losq 1985; Alexander, Eun & Jankiramanan 1987); gaining access to foreign capital market and increasing visibility and ability to raise equity (Baker et al. 2002); increasing shareholder base (Merton, 1987); and enhancing trading liquidity (Amihud & Mendelson, 1986; Domowitz et al. 1998). A number of recent studies (Coffee, 1999, 2002; La Porta et al. 1997, 1998) have particularly emphasised that firms can engage in a higher level of investors' protection to respect minority shareholders' rights by cross-listing in a market that has a stronger and enforceable legal system (such as the US stock exchanges), in turn substituting for their weak home country institutions. This argument is known as the bonding hypothesis in the literature.

In many countries, especially in the emerging capital markets, minority investors are poorly protected by the local legal environment and controlling shareholders who can extract value from the firm efficiently and easily. However, by cross-listing their securities in a better legal protection, market firms can escape a weak domestic legal environment and reduce investor expropriation risk (La Porta et al. 1997, 1998). As early as 1997, La Porta et al. (1997) explained the differences between national corporate governance systems by differences in the legal systems. They show that minority shareholders are better protected in the common law system than in the civil law system. As a result, better protection of minority shareholders promotes the separation of ownership and control. Later, the concept of bonding first appeared in Stulz's (1999) study. More recently, Coffee (1999, 2002) borrowed the term bonding to

[6] Early research in the area of cross-listing postulated the economic benefits of cross-listing could be found in many studies, especially Karolyi (2006) and Abdallah et al. (2010).

refer to a mechanism by which firms incorporated in a jurisdiction with weak protection of minority rights or poor enforcement mechanisms can voluntarily subject themselves to higher disclosure standards and stricter enforcement in order to attract investors who would otherwise be reluctant to invest (or who would discount such stocks to reflect the risk of minority expropriation). Bonding was originally used in law and economics to refer to the costs or liabilities that an agent or entrepreneur will incur to assure investors that it will perform as promised, thereby enabling it to market its securities at a higher price (King and Segal 2004). Coffee (1999, 2002) suggests that foreign firms may cross-list on the US stock exchanges in order to commit themselves to protecting minority shareholders. Later, a number of empirical studies have been tested for this bonding theory using different proxies. In the literature, these bonding practices include adopting the stringent international accounting standards, hiring reputable outside auditors, having outside directors, diversifying ownership by having foreign strategic investors as block holders, and finally, and most importantly, listing the firms on foreign stock exchanges (Cai 2007).

A number of papers have suggested that one useful way to 'bond' managers not to take excessive private benefits is to cross-list the firm's stock on an exchange that imposes higher legal and regulatory costs than the firm's primary exchange (Karolyi 2006). Coffee (1999, 2002) and Stulz (1999) were the first to rationalise in this way the decision by non-US firms to list on the US exchanges either directly or through an ADR program. Both the functional convergence hypothesis offered by Coffee (1999, 2002) and the bonding hypothesis proposed by Stulz (1999), and Benos and Weisbach (2004) declared that firms wishing to raise capital by bonding themselves to protect the interests of their minority shareholders, according to the theory's first part, increases long-run *q* (Tobin's *q*, the measurement of firm value). One way to accomplish this bonding is to use a US listing (cross-list on an exchange like the New York Stock Exchange or NASDAQ), whose legal system protects minority shareholder interests as well as any other in the world to assure that minority shareholders are less likely to be exploited. Coffee (1999, 2002), Fuerst (1998), and Stulz (1999) also argued that cross-listing on a US stock exchange can enhance the protection of minority investors for firms coming from the countries who have weak protection of minority rights or poor enforcement mechanisms. La Porta et al. (1997, 1998) also argue that firms can escape a weak domestic legal environment and reduce investor expropriation risk by cross-listing their securities in a better legal protection market. They suggest that common law legal

system protects investors better than civil law systems and investors may not want to hold equities in a firm from a country with poor investor protection rules because they may fear expropriation by concentrated shareholders or managers.

Reese and Weisbach (2002) provided evidence concerning the expected relations between cross-listings, shareholder protection, and equity offerings by examining a total sample of 2038 cross-listings as of June 1999. Their results showed that after cross-listing in the US, firms from countries with weak investor protection are able to raise more equity capital at home. Doidge (2004) tested the bonding hypothesis in the context of non-US firms cross-listed in the US via ADRs and found improvements in the protection afforded to minority investors and decreases in the private benefits of control. He compiles a panel dataset of 745 non-US firms from 20 countries that have dual-class share structures via level 2 or 3 ADRs through 1994 to 2001. By conducting panel data regression and event study analyses, consistent with the bonding hypothesis, he found that firms cross-listed on a US exchange on average, have statistically significant 43 per cent lower voting premiums than firms that do not, meanwhile, the size of difference in voting premiums is negatively related to measures of minority investor protection. Doidge, Karolyi and Stulz (2004) developed a simple model stating that a firm lists in the US if its controlling shareholders find it advantageous to limit their expropriation from minority shareholders, and then to model the trade-off that controlling shareholders face when deciding whether to list or not. Through the study of the valuation difference between the foreign companies with shares cross-listed in the US with the non-cross-listed firms from the same country, their research showed that firms from around world that cross-list their shares in the US have higher valuations than other firms from their country that do not cross-list. They interpreted this as the result that the controlling shareholders of firms that wish to cross-list have more incentives to limit their consumption of private benefits from control, which directly supports the bonding argument. Lins, Strickland and Zenner (2005) also found that firms from emerging markets benefits from a US listing through an enhanced access to external capital markets, as well as the improvement of shareholder protection.

Kumar and Ramchand (2006) provided a framework that complements the bonding hypothesis in international cross-listing by highlighting the incentives for dominant shareholders of firms to cross-list their securities. They theoretically and empirically examined the relationship between dominant shareholder influence, takeover and the

cross-listing, claiming that by cross-listing in a foreign country with an active takeover market and strong investor protection rights, the firm is able to reduce the costs of equity-financed acquisition. Moreover, dominant shareholders in these firms trade-off control dilution against value creation from acquisitions, whose benefits still accrue substantially to them. Using Cox and Tobit regression analysis, Kumar and Ramchand (2006) empirically tested the predictions on a sample of 364 firms that cross-listed in the US during 1990–2003, and the results supported the theoretical framework that dominant shareholder ownership and control rights dilute subsequence to the cross-listing.

The studies above show that improving shareholder protection may explain why some non-US firms cross-listed their shares in US. However, there is growing debate on the bonding theories. Some recent studies suggest that bonding may not be a complete shield for minority shareholders (Coffee 2002). MacNeil (2001) also found that the real legal commitments made by foreign firms that listed in London are not as strong as they first appeared. The simple model of bonding hypothesis could not reflect the complex manner in which an overseas listing links a company with the system of corporate regulation in an overseas listing jurisdiction. Licht (2001a, 2001b, 2003) argues that the US Securities and Exchange Commission (SEC) is an inefficient body that does not enforce corporate governance rules for foreign issuers and maintains a 'hands off' policy for the most part. In particular, Siegel (2005) empirically tested the bonding theories by examining all Mexican companies with a Mexican equity listing prior to the crisis of 1994–1995. The evidence showed that the US SEC and minority shareholders have not effectively enforced the law against cross-listed foreign firms, cross-listing in the US did not deter Mexican firms' insiders from expropriating corporate resources. Moreover, SEC action against any US-listed foreign firms has been rare and mostly ineffective throughout the history of the federal securities laws. Gozzi, Levine and Schmuckler (2006) compiled a database of over 9,000 international and domestic firms across 74 countries over the period 1989–2000, comprising almost 67,000 firm-year observations, to conduct the analysis on the bonding and corporation cross-listing by documenting the evolution of Tobin's q before, during and after firms' cross-listing (more broaden, firms internationalise). They found that Tobin's q does not rise after internationalisation. The evidence challenged the statements that cross-listing produces an enduring effect on q by bonding firms to a better corporate governance framework

that includes the reduction expropriation of corporate resources by dominant shareholders.

Another contribution against the bonding hypothesis is called reputational bonding, which contextualises that the place where the bonding happens is through the operation of the financial markets by the reputational mechanism, not through the courts (Sigel 2005). King and Sigel (2004) examined cross-listing premiums for Canadian firms relative to their domestic counterparts, and argue that reputational bonding is what matters, not legal bonding. In Hong Kong, this legal enforcement effectiveness also caused some concern when several Mainland Chinese firms were involved a series of scandals. For example, Beijing Media, a Hong Kong listed Mainland Chinese private firm, never disclosed any information to the Securities and Futures Commission (SFC) of Hong Kong about the arrest of their six senior management members by the Beijing anti-corruption bureau between June to September 2005. The Hong Kong investors had no idea about this until this information was revealed in a Chinese magazine called Finance and Economics (Sun et al. 2006). Further, Euro-Asia Agricorp, Fareast Pharmacy and Kelong Electric were also involved into different criminal offences committed by these firms' management (Sun et al. 2006)

Bris, Cantale and Nishiotis (2007) made an effort to separate various cross-listing effects such as increased liquidity, governance, removal of barriers and greater financial flexibility and showed that the effects of improving investor protection are economically small. Dewenter et al. (2005) demonstrated that the emerging markets with relatively weak legal regimes can offer value-relevant bonding mechanisms to local firms by observing Korean firms listing on Korea Securities Dealers Automated Quotation System (KOSDAQ) having higher Tobin's q values than the Korean Stock Exchange. Sun et al. (2006) tested the bonding hypothesis in the context of Chinese firms listed in Hong Kong and found strong support evidence. They contrasted a sample of 53 Chinese firms listed in Hong Kong against a control sample of domestic firms listed only on China's Shanghai and Shenzhen markets, and observe a general existence of cross-listing premiums of H-share firms. Between the comparison of B-shares and H-shares, the cross-listing premium is larger for H-share than for B-share firms, which is measured by higher market-to-book value ratio (MBR ratio) and higher price-to-earnings ratio (P/E ratio). Both A-shares and B-shares are traded in China and carry the

same voting right, and the only difference between A-shares and B-shares is the accounting method used (Cai 2007).

3.2.1 Hypothesis Development

When Chinese firms choose to list their shares internationally (no matter whether it is a SOE or a private firm), they are committed to an increased disclosure standard and increased monitoring from the host country's laws and regulations, which bonding the less expropriation of firm resources by the controlling shareholders. Diamond and Verrecchia (1991) and Baiman and Verrecchia (1996) draw a distinction between a commitment and a voluntary disclosure, explaining that a commitment decision is made before it observes the content of the disclosure, and a voluntary decision is made after it observes the content. For example, in the context of accounting standards, the Chinese cross-listed firms that adopt International Accounting Standard (IAS) amounts to a credible promise that it will disclosure all information, regardless of content, to all investors, regardless of nationality. Thus, this commitment effectively eliminates information asymmetry and increases the firm's value. Therefore, the above perspective reveals the possibility that overseas listing for these Chinese firms no matter whether they are SOEs or private firms can produce bonding effects due to increased monitoring of foreign financial intermediaries. Previous literature about the law and finance (La Porta, Lopezde-Silanes, Shleifer & Vishny 1997, 1998, 1999; Coffee 1999; Stulz 1999) also reveals that strong legal protection of minority shareholders generates higher firm valuation. In summary, the cross-listed Chinese firms increase information disclosure can still enjoy high valuations although under a poor legal environment, which leads to our first hypothesis as formally stated below:

- Hypothesis 1: The firm values of Chinese firms listed in both international and domestic stock exchanges are higher than that of Chinese firms listed only locally in the Chinese stock exchange.

Corporate governance mechanism includes exogenous and endogenous elements. The exogenous element includes political, legal and cultural framework, and the endogenous element includes the board of directors, management compensation, supervision or independent directors (Chen 2005). In the Chinese context, corporate governance improvements include the introduction of independent directors, the size of the board,

and the regulation of the role of the board of directors in listed firms. Auditing financial reports is another corporate governance practice for public offerings in jurisdiction adopted by Chinese firms (Cai 2007). However, poor corporate governance conducted by the listed firms in the Chinese stock exchange has been blamed for the poor performance of the Chinese stock market. The absence of strong legal enforcement procedures in China has provided the possibility for controlling shareholders and/or company management to manipulate financial reports, which is often assisted by some accounting and auditing service firms (Cai 2007). Therefore, there is no clear sign suggesting that these governance practices of locally listed Chinese firms would be eliminated in the near future, although the Chinese government has taken measures (such as implementing different financial and bank reforms, stock market reforms) with the aim to improve the corporate governance practices of Chinese firms listed in the Chinese stock exchange.

Coffee (1999, 2002) suggests that firms in a weak corporate governance protection environment could bond themselves by cross-listing and voluntarily subjecting themselves to higher disclosure standards and greater threat of enforcement. Chinese firms listing in the international stock exchanges are required to meet the corporate governance as regulated in each respective stock exchange. Following the logic of bonding hypothesis, this may provide investors with the hope that the Chinese firms' cross-listing in stock exchanges that operate in an environment with an effective corporate governance mechanism may help the management of the Chinese firms to become disciplinary in their practice and act in the best interest of their shareholders. More importantly, the different degree of legal protection given provided for shareholders and creditors could be the single most important factor explaining differences in corporate governance across countries (La Porta, Lopes-de-Silanes, Shleifer & Vishny 1999). It is expected that the cross-listed Chinese firms should adopt higher quality governance and disclosure practices, and therefore have better corporate governance relative to these non-cross-listed firms. Therefore, the investors may put higher value on firms that are cross-listed in international stock exchanges, which is then expected to yield a better firm performance when compared to the firms listed locally in the Chinese stock exchange. These theoretical arguments lead to the second hypothesis as formally stated below:

- Hypothesis 2: The corporate governance of Chinese firms listed in international stock exchanges exhibits bonding effects by adopting the relevant corporate governance mechanisms.

Lastly, Chinese firms listed in different stock exchanges do have specific characteristics regarding the corporate governance practices that are set up by different stock exchanges, although these Chinese firms are labelled by their own characteristics. For example, there is no strict rule that asks the company to have independent directors in London AIM market. However, it does ask that the board should consist of executive and non-executive directors to keep the balance of the board. Even under the same requirement for independent director system, sometimes, the number of independent directors does not comply with the code's requirement that at least one-third of the board should be made up of independent directors, which brings a strong and independent element to the board. Most of the stock exchanges share one of the common corporate governance practices, which is the duty separation of the chairperson and CEO. Again, sometimes, the board has not adopted the recommendation of the code on the division of responsibilities between the chairperson and CEO with different reasons. For example, they might claim that the board is of the view that there is a sufficiently strong independent element on the board to enable the independent exercise of objective judgement on corporate affairs of the group, or there are sufficient safeguards in place to ensure that the management is accountable to the board as a whole. Meanwhile, most of the overseas Chinese listings do follow the stock exchange requirements, such as the adoption of the international accounting standard and have the international famous auditing firms to audit the financial statements. Therefore, corporate governance mechanisms along with the cross-listing location might have different effects on firm valuation, and the third hypothesis is followed as below:

- Hypothesis 3: The relationship between the bonding corporate governance mechanisms on firm valuation is different with different listing locations.

3.3 Multiple Listing and Informed Trading

3.3.1 Dual-listing and Market Co-movement

If international financial markets are perfectly integrated, stock price movement should not be affected by the trading location. However, prior studies including a country funds

study (Bodurtha, Kim & Lee1995), a twin stocks study (Froot & Dabora 1999), and an ADR study (Kim et al. 2000; Suh 2003) have suggested that stock price is very much influenced by the market where they are traded, which they interpret as market or investor sentiment. Chong and Su (2006) used intraday high-frequency data and examined the co-movements of Chinese A-share and H-shares listed in Hong Kong. The study found that only a small portion of these cross-listed stocks demonstrated a co-movement in their A- and H-share prices, suggesting that China and Hong Kong are two segmented markets. Wei (2000), and Wang and Jiang (2004) specified that market sentiment may be an important factor explaining the price difference for the cross-listed China A-shares and Hong Kong H-shares. Wang and Jiang (2004) found that H-shares behave more like Hong Kong stocks, while Mainland China A-shares retain significant exposure to their domestic market. Bedi et al. (2003) tested excess co-movement for three Anglo-Australian dual-listed corporations. Their results confirm the excess co-movement findings of Froot and Dabora (1999), implying that excess co-movement with aggregate market indices is a pervasive feature of the pricing of dual-listed corporations.

3.3.2 Dual-listing and Market Cointegration

Cointegration estimation techniques, since they were developed by Engle and Granger (1981), have been widely adopted by scholars of finance and economics to examine the interdependency of different equity markets (Chan et al. 1992; Chan et al. 1999; Huang et al. 2000; Worthington & Higgs 2004; Zhou et al. 2005; Luo et al. 2005; Aggarwal et al. 2005; Su et al. 2007; Shen et al. 2007), international bond markets (Mills et al. 1991; Clare et al. 1995), foreign exchange rate (AuYong et al. 2004), and international diversification (Chang & Caudil 2005; Chang 2001). The following sections review the related research in this aspect.

Click and Plummer (2005) studied the five stock markets integration of the formal Association of South East Asian Nations (ASEAN) using the time series technique of cointegration to extract long-run relationships. Their empirical results suggest that the ASEAN stock markets are cointegrated in the economic sense, but are far from complete, since there is only one cointegrating vector, leaving four common trends among the five variables. Wong et al. (2005) investigated the cointegration relationship between the Indian market and three developed markets (US, Japan and UK) by

employing a fractional cointegration approach. The researchers investigated the long-run equilibrium relationship and short run dynamic inter linkages between these markets using the weekly data of the related indices of these markets. Their findings suggest that the India stock market is statistically significantly cointegrated with US, UK and Japan markets.

Mo et al. (2005) studied the stock price cointegration of Taiwan market and its major trading partners of US and Japan markets using non-parametric cointegration test. The results suggest that the Taiwan market is pair-wise cointegrated with the markets of the Japan and the US during the examining period. Daly (2003) investigated the interdependence of the ASEAN stock markets and the advanced stock markets of Australia, Germany and the US pre- and post-October 1997 period. There was no evidence in support of cointegrating relationship between the stock markets of Australia, Germany and the US with the markets of South East Asia in either the pre- or post-crisis periods when adapting the multivariate cointegration technique. However, the only evidence to support the existence of a bi-variate long-run relationship between stock markets was the presence of one cointegrating vector between the stock markets of Thailand and Indonesia, and between Thailand and the Philippines, over both the pre- and post-1997 crisis periods. Chan et al. (1992) used unit root and cointegration tests to examine the relationships among the stock markets in Hong Kong, South Korea, Singapore, Taiwan, Japan and the US. The pair-wise and higher-order cointegration tests indicated that there was no evidence of cointegration among the stock prices. It also implied that international diversification among the markets is effective. Ostermark (2001) provided evidence on the cointegration between the Finnish and Japanese financial markets using multivariate cointegration analysis as well.

Besides the cointegrated studies using market indices, cointegrated studies with stock prices have also been conducted. Agarwal and Kyaw (2005) documented that the equity prices in the three North American Free Trade Agreement (NAFTA) countries (Canada, US and Mexico) were cointegrated for the post-NAFTA period with daily, weekly and monthly data. Lok and Kalev (2006) examined the intraday price behaviour of Australian stocks listed on the Australian Stock Exchange and cross-listed on the New Zealand Stock Exchange, as well as the dynamics of the New Zealand securities listed on the New Zealand Stock Exchange and cross-listed on the Australian Stock Exchange. Using two error correction models and unit root test and cointegration test in their study,

they found that the prices of the dual-listed securities were linked by the long-run equilibrium of equal prices, which also implied that arbitrage opportunities are not generally available in the trading of the cross-listed stocks across the two markets. Meanwhile, the Granger causality tests between the two markets during the trading overlap suggests that the two markets may be integrated as a whole, rather than just with respect to the dual-listed stocks.

The studies about Chinese stock market integration have mainly focused on the relationship between the Mainland China, Hong Kong and Taiwan markets by analysing the indices, price, volatility, stock returns and cointegration, which will be briefly reviewed in the discussion below.

Zhu et al. (2004) examined the returns and volatility of a series of indices of Shanghai Composite Index, the Shenzhen Composite Sub-index and Hong Kong Hang Seng Index, they found that the index series were non-stationary and cointegration vectors and error correction do not exist. They also found an existence of a positive feedback relationship between Shanghai and Shenzhen stock markets. Another study by Zhou et al. (2005) examined the cointegration among three markets (Shanghai, Shenzhen and Hong Kong) in China before and after Hong Kong's return to China in 1997 by examining the stock returns, volatility and cointegration. The results showed that these three Chinese Stock markets were cointegrated over the entire sample period and became more closely related after Hong Kong's return to China.

Lin and Wu (2006) studied the linkage of China's stock market with Hong Kong, Taiwan and the US by investigating the information flow direction among the A- and B-share markets as well as Hong Kong H-share and Red Chips markets. Employing two methods of Bernanke-Sims decomposition and the impulse response analysis, and the Multivariate GARCH models, they concluded that the China's stock markets have a weak linkage with the Hong Kong, Taiwan and US markets. Further, the Shanghai stock market appears to dominate the Shenzhen stock market. Su and Chong (2007) studied the interrelations between the cross-listed securities of Chinese companies listed and traded in Hong Kong and US, adapting two popular common factor models (the permanent-transitory model and information shares model) to investigate the price discovery. The empirical results suggested that the prices of the same stock listed in Hong Kong and New York stock exchanges were cointegrated with one common factor

and mutually adjusting, and Hong Kong made more contributions than New York to the price discovery process.

The review of literature above mainly focuses on market integration with the application of cointegration techniques using market indices. Although interaction among markets could tell us the relationships between them, it is still worthwhile to investigate the behaviour of individual share prices and returns of the dual- or triple-listed shares issued by the same company, to explore the relationship among markets further.

3.3.3 Information Transmission

Chowdhry and Nanda (1991) argued that when a security is traded in several markets, informed traders have greater opportunities to exploit private information. They further explained that the expected return of informed traders is diminished by a timely transmission of pricing information to satellite markets—a phenomenon that may be caused by competing market makers who offer to the general public pricing information at reduced costs. A significant causal connection between home markets and US markets has also been found in other studies. Hauser et al. (1998) used data on several stocks listed on both the Tel Aviv Stock Exchange and the NASDAQ in order to investigate the information transmission between these two markets. Two alternative tests for causality, both based in essence on the Granger (1969) idea were used. The results showed that the stock price behaviour in the Tel Aviv Stock Exchange affects the price in the US. However, price behaviour in New York affects prices in Tel Aviv Stock Exchange too; the price causality in dual-listed stocks is unidirectional from the domestic to the foreign market.

Most of the information flow studies have been based on aggregate market indices between or among different markets. The inter-market information flow based on the cross-listing has also been examined extensively. Adopting a modified GARCH modelling approach and taking into account the influence of different regulatory structures across stock exchanges where firms are cross-listed, Koulakiotis et al. (2006) examined the volatility effect for a sample of cross-listed firms in specific European markets of Brussels and Milan stock exchanges, and found that that information spill-over effects were important across specific European markets for cross-listed securities and that different regulatory environments have a significant impact on information

spill-over. The magnitude and persistence of these information spill-over varies according to the location of cross-listings.

Using the daily opening and closing stock prices of seven Japanese dual-listings that trading in New York Stock Exchange and Tokyo Stock Exchange, Lau, Diltz and Apilado (1994) examined the information transmission between the two markets. The results showed that transmission of pricing information runs in both directions between New York and Tokyo, and the transmission of information is immediate when running from New York to Tokyo and both immediate and throughout the trading day when running from Tokyo to New York, suggesting that market imperfections inhibit information transfer between the dual-listed securities' return are not apparent, and arbitrage opportunities is not available.

Bae et al. (1999) provided further empirical evidence concerning the information transmission of dually listed securities. They examine 18 companies dual-listed in Hong Kong and London, using daily opening and closing prices, and found that transmission of pricing information occurs immediately and continuously throughout the trading day in both directions from Hong Kong to London, and vice versa. Wang et al. (2002) examined the integration of stock markets in terms of stock return and volatility transmission based on the 22 dual-listed securities trading in Hong Kong and London with GJR-GARCH model. They provided evidence of returns and volatility spill-over from Hong Kong to London, and vice versa.

3.3.4 Price Discovery

When a firm makes its decision to list securities on international stock exchanges, it faces a complex trading structure. Trading is taken among different markets; however, each market plays a different role. In an international capital market setting, one would expect the home market of multi-traded securities to be the dominant market because the markets around the world are more likely to be informationally segmented and information about the underlying company is more likely to stem from the home market (Licht 1998). Normally, the firm's home market operates as a dominant market, capturing most of the trading volume and leading the process of price discovery (Garbade & Silber 1979). Price discovery is defined as the search for an equilibrium price and is a key function of a stock exchange (Karolyi 2006).

Multiple listing offers a unique opportunity to study the dynamics of price discovery across markets. Garbade and Silber (1979) were the first to document the contribution to the price discovery of different markets for dually listed stocks within the US. They were also the first who introduced the concept of dominant and satellite markets, and revealed that the New York Stock Exchange performs a dominant role in the price-discovery process, regional exchanges are 'satellites, but not pure satellites'[7]. A significant number of studies have since conducted empirical studies with the attempts to provide more evidence for the price-discovery prediction. Neumark et al. (1991), Eun and Shim (1989), and Hamao, Masulis and Ng (1990) supported that foreign market acts as a satellite to the domestic market. Neumark et al. (1991) studied a sample of US securities multiple listed on foreign markets and found that price movements fully reflected price volatility existing on the US domestic market, but that US price movements reflected only to a lesser extent the volatility on foreign markets. Harris et al. (1995) and Hasbrouck (1995) examined the relative contribution of the New York Stock Exchanges to the price discovery of US stocks trading on these exchanges. Harris et al.'s (1995) study employs the common-factor error correction estimation methods of Gonzalo and Granger (1995) to measure how much prices in different trading venues adjust due to cross-market information flows. Conversely, Hasbrouck (1995) employs the common-trends vector autoregression (VAR) representation and computes the fraction of long-term total variation in returns explained by each market from a variance-decomposition analysis, which he calls the 'information share'.

A number of studies of multi-market trading have applied these techniques. For example, Lieberman et al. (1999) also employ an error correction approach studying Israeli stocks multiply listed on the American Over the Counter (OTC) market. They found that the Israeli domestic market acted as the dominant market and the foreign market acted as a satellite market. Pascual et al. (2006) examined five Spanish stocks cross-listed on the New York Stock Exchange using Hasbrouck's (1995) information share model, and found that the contribution of the New York Stock Exchange to the price discovery only varies from one per cent to three per cent. Eun and Sabherwal (2003) applied Harris et al.'s error correction models, examined 62 Canadian companies dual-listed on the Toronto Stock Exchange and US exchanges. They performed cross-

[7] Garbade and Silber empirically examined five actively traded stocks that dually-traded on the New York Stock Exchange, and the other regional stock exchange such as the Midwest Stock Exchange and the Pacific Stock Exchange during August 1973 and September 1975.

sectional regressions of these estimated relative contributions of the two markets and found that the most important variable is the proportion of total trading volume in the US. That is, the higher the fraction of total trading taking place in the US, the higher is the contribution of the US market to price discovery.

Gramming et al. (2005) also apply the Gonzalo-Granger error correction model to study the contributions of New York and Frankfurt for three blue-chip German firms during overlapping trading hours with high frequency quotes. Considering the exchange rate effects, they reported that price discovery occurs largely in the home market during the overlapping period. Hedvall et al. (1997) found a consistent result for Nokia's New York Stock Exchange and Helsinki prices from 1994 to 1996. In this case, the New York Stock Exchange captures almost 60 per cent of the post-listing trading volume, so it is not surprising that the Gonzalo-Granger variance decomposition shows that the New York Stock Exchange plays the dominant price discovery role. Pascual et al. (2006) use this same technique for five Spanish stocks using two-hour overlapping periods for the year 2000. Menkveld et al. (2003) examined one year of transactions data on seven major Dutch firms, and extend the analysis to incorporate information from US trading during the overnight non-overlapping period as a benchmark period of activity. They uncovered important price and quote activity around the New York Stock Exchange opening for these stocks.

Agarwal et al. (2007) examined price discovery for 17 stocks traded in Hong Kong and London using bid and asked for opening and closing prices. They investigated the dynamics of price transmission processes between these two markets, and the results were similar to that of Werner and Kleidon (1996) that London trades follow a free-rider pattern in terms of cross-market price discovery. Agarwal et al. (2007) suggested that the London market plays only a limited role in price discovery in the Hong Kong market, and Hong Kong's trading predominantly determines price discovery in London. They concluded that London trading is liquidity-driven but not information-driven. Adopting two main error correction models (unit root test and cointegration test), Lok and Kalev (2006) examined the intraday price behaviour of Australian stocks listed on the Australian Stock Exchange and cross-listed on the New Zealand Stock Exchange, as well as the dynamics of the New Zealand securities listed on the New Zealand Stock Exchange and cross-listed on the Australian Stock Exchange. They found that the prices of the dual-listed securities are linked by the long-run equilibrium of equal prices,

which also implies that arbitrage opportunities are not generally available in the trading of the cross-listed stocks across the two markets. Meanwhile, the Granger causality tests between the two markets during the trading overlap suggests that the two markets may be integrated as a whole, rather than just with respect to the dual-listed stocks.

Su and Chong (2007) examined the price discovery for eight Chinese cross-listing securities trading in Hong Kong and New York Stock Exchanges, adopting two popular common factor models (the permanent-transitory model and information shares model) using low-frequency data. The empirical results suggest that the prices of the same Chinese stock listed in Hong Kong and New York stock exchanges are cointegrated with one common factor and mutually adjusting, and Hong Kong makes more contributions than New York to the price discovery process.

A few other studies on price discovery from emerging markets cross-listed on developed markets have been conducted. Ding et al. (1999) investigated the price discovery of a large Malaysian conglomerate traded in both the Stock Exchange of Singapore and Kuala Lumpur Stock Exchange with Gonzalo and Granger (1995) common long-memory factors model, and found that nearly 70 per cent of the price discovery occurs in the home country and that 26–32 per cent can be attributed to the Stock Exchange of Singapore. Kadapakkam et al. (2003) examined the Indian stocks dual-listed on the London Stock Exchange, and found that each market contributes almost equally to price discovery. Using intraday high-frequency data, Chong and Su (2006) investigated the co-movements of Chinese A-shares and H-shares listed in Hong Kong and discovered that there was only a small portion of these cross-listed stocks that had a co-movement in their A- and H-share prices, suggesting that that China and Hong Kong are two segmented markets. However, for those small portion co-movement stocks, the A-share market played a major role in the price discovery contribution.

In general, most of the empirical studies of the price discovery process of securities that trade on multiple markets provide evidence that securities traded at the home market leads the price discovery.

3.3.5 Hypothesis Development

The phenomenon of dual-listed Chinese shares trading at quite different prices is interesting, while these differences do not provide an opportunity for pure risk-free arbitrage or limited to arbitrage, they are nonetheless an anomaly. Although a very rich literature for the price disparity of the Chinese dual-listed securities (please refer to section 2.4.5) have been documented, Froot and Dabora (1999) find that the price differential is correlated with the relative performance of the markets in which the twins trade most. Therefore, it is interesting to see whether this price differential is correlated with the relative performance of the markets in which these dual-listed Chinese shares trade most, as proposed by Froot and Dabora (1999) that this co-movement is a reflection of prices in each market being influenced by market sentiment. Thus, we have the following hypothesis:

- Hypothesis 4: The changes in the price differential are uncorrelated with the performance of the two markets on which the Chinese dual-listed securities trade.

With enhanced globalization of financial markets, more and more Chinese firms are now cross-listing their securities overseas, but does this lead to a more integrated Chinese equity market? The market integration studies reviewed in section 2.3.2 are mostly conducted in the national equity markets level. These studies focus on the relationship among different international equity markets by analysing the behaviour of national market indices. Akdogan (1995) finds a growing degree of integration among certain markets, particularly in the developed countries. It is also documented that the Chinese equity market is segmented from the international equity markets (Tunaru et al., 2006). However, when Chinese securities cross-listed in different equity markets, does the integrated equity market such as Hong Kong and New York demonstrate the cointegration relationship in terms of these dual-listed securities? For the triple-listed Chinese security, the price of its Hong Kong listing and the price of its New York listing are very similar to each other after the exchange rate considered. To examine the market cointegration by studying the dual- and triple-listed Chinese securities under the framework of the cointegration techniques, we develop the following hypothesis:

- Hypothesis 5: The Chinese equity market is cointegrated with the other international equity markets in terms of the dual-listed securities.

Many of the previous studies of information transmission across markets have focused exclusively on the effects of scheduled macroeconomic announcements on stock returns and volatility in another market by studying the stock price volatility (Jaiswal & Jithendranathan, 2009). In terms of dual-listing, information transmission study is examining when and where the transmission of pricing information occurs. To study the pricing information transmission for Chinese firms dual-listed in two or three markets, we develop the following hypothesis:

- Hypothesis 6: For Chinese cross market dual-listings, the home market of China is where to release of public information takes place and is dominant for the information transmission.

So far, the empirical evidence regarding where price discovery occurs has been mixed and conflicting. Studies of price discovery have examined the relative contribution of the U.S. stock exchanges and the other international stock exchanges to the price discovery of U.S. stocks trading on these exchanges, or foreign stocks cross-trading on U.S. stock exchanges. It is obvious that the home stock exchange is likely to contribute substantially to price discovery as it is the security's home market where substantial information is expected to be produced. However, it is also expected that as among the largest and most liquid exchanges in the world, the dominance of the U.S. stock exchanges is also likely to contribute significantly to price discovery (Eun and Sabherwal, 2003). Whether or not all of the home and host stock exchanges contribute to the price discovery of a security cross-listed in multiple exchanges is an interesting issue. Further, the question becomes more interesting when the security listed on more than two stock exchanges, such as Chinese securities triple-listed on the China Shanghai stock exchange, Hong Kong stock exchange and New York stock exchange. Therefore, one of the objectives of this study is to examine the extent to which stock exchange contribute to the price discovery for the Chinese securities cross-listed on different stock exchanges. And we develop the following hypothesis:

- Hypothesis 7: The Chinese home stock exchange contributes to the price discovery when Chinese securities dual- and triple-listed in different international stock exchanges.

3.4 Price Disparity and Arbitrage

3.4.1 Theoretic Foundation

The Law of One Price (LOP) is a basic component of financial economic theorising (Ezzel, Miles & Mullherin 2003). It states that the identical goods must have identical prices barring transaction costs and foreign exchange rates; otherwise, goods with a lower price would flow from one place to another that has a higher price for the same goods (Lamont & Thaler 2003a, 2003b). Traditionally, economists thought that LOP should hold in financial markets as well (Lamont & Thaler 2003a). Recent studies on international market integration have developed a new measure of international financial integration following the principle of LOP. LOP suggests that the two markets on which a cross-listed security trades should be integrated, in a world where capital restrictions and trading barriers are increasingly minimal, same securities should sell at the same price in all market, adjusted for exchange rates (Jithendranathan et al. 2000; Lok & Kalve 2006). Therefore, based on LOP, market integration means that in an integrated financial market where there is no restriction to trade, then identical assets should be priced identically across borders adjusted for exchange rates (Lok & Kalve 2006; Levy et al. 2006; Jithendranathan et al. 2000), that is, markets are said to be perfectly integrated if LOP holds across them (Chen & Knez 1995). However, violation of LOP does not mean that the capital markets are segmented because different trading hours across different markets might cause different closing prices. Akdogan (1995) also pointed out that the failure of LOP can be attributed to possible presence of barriers, regulations or controls for international capital movements. Similarly, Black (1978) and Solnik (1974) documented that the formal and informal barriers for the capital markets, which include exchange controls, differential taxation of portfolio income for investors in different countries, restrictions on ownership of securities according to the nationality of the investor, information cost, transaction costs and exchange rate risk. While the empirical evidence does not support the view of a completely integrated market, the findings of many prior studies have suggested that markets are at least to some extent integrated (Kryzanowski & Zhang 2002; Lowengrub & Melvin 2002; Werner & Kleidon 1996). In addition, Chowdhry and Nanda (1991) investigated the information lags between different trading venues for these identical securities, and stated that this information lags produce short-term disparities in the prices at which the security trades at different locations at any given time. They also suggested that if more than one market is trading for one security, a dominant market will emerged. This is because

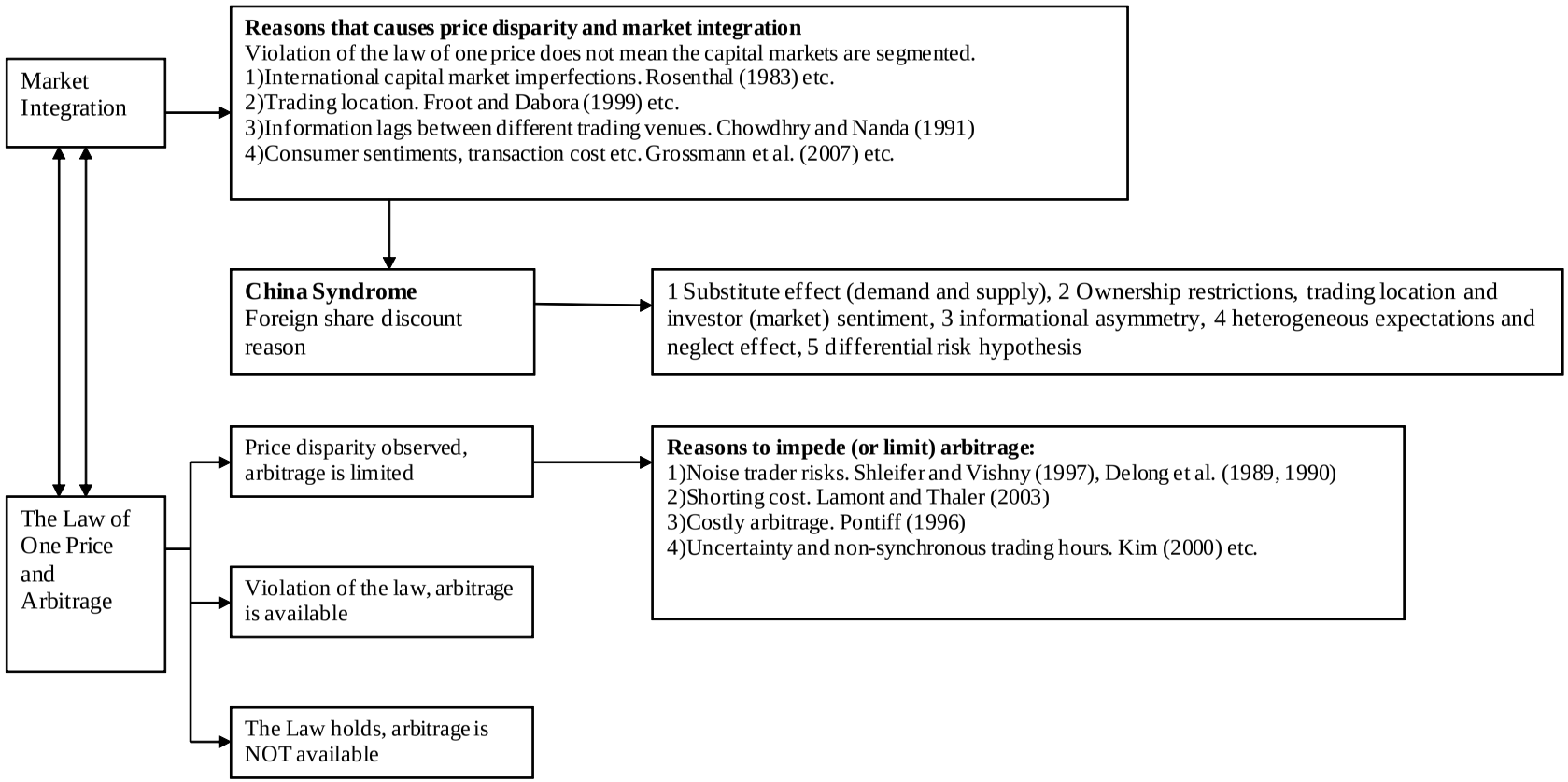
liquidity traders look for markets with the lowest trading costs. They also predicted that a cross-listing will not change return variance. Figure 3.1 presents the theoretical framework between market integration and LOP, and the detailed review of the theory and empirical studies are present at section 3.4.2. The studies of price disparity for Chinese dual-listed securities are reviewed section 3.4.5.

Therefore, when LOP does not hold, arbitrage opportunities occur. Arbitrage, as one of the fundamental concepts in finance is defined as the simultaneous purchase and sale of the same or essentially similar security in two different markets for advantageously different prices (Sharpe & Alexander 1990), which results in immediate risk-free profit. For example, if a security's price on the New York Stock Exchange is trading out of sync with its corresponding shares in another market, a trader could simultaneously sell (short) the more expensive of the two and buy the other, thus profiting on the difference. This type of arbitrage requires the violation of LOP. Arbitrage exists in different types. In the context of capital market integration without barriers to capital movements, LOP can be interested as that the identical security trading in different markets must have the identical prices, arbitrage would assure that the market price of a security in one country would be equal to the market price of the same security in the second country, expressed in the currency of the first country at the current exchange rate (Maldonado & Saunders 1983; Lamont & Thaler 2003a). This section will provide a detailed review of LOP and arbitrage in the context of cross-listing.

3.4.2 Empirical Studies on Arbitrage

There is no consensus in the literature regarding the price discrepancy and arbitrage of the cross-listed securities. Maldonado and Saunders (1983), Kato et al. (1991), Park and Tavakkol (1994), Ding (2000), and Lok and Kalev (2006) found no significant price disparity between the cross-listing shares, they also suggested that no obvious arbitrage opportunities exist. In contrast, Wahab, Lashgari and Cohn (1992), Kaul and Mehrotra (2000) and Suarez (2005) did find arbitrage opportunities. Bailey et al. (1999) and Miller and Morey (1996) found price differences, but suggested that arbitrage is difficult. The details of the arguments are discussed in the following section.

Figure 3.1: Theoretical Foundation



The opportunity of arbitrage in financial markets is inconclusive. Karolyi and Stulz (1996), Kato, Linn and Schallheim (1991), Miller and Morey (1996), and Wahab, Lashgari, and Cohn (1992) investigated the arbitrage opportunity in ADR market, and found little evidence for profitable opportunities in this ADR market. Maldonado and Saunders (1983) examined the one-year price behaviour of 37 US multinational corporation stocks traded simultaneously on the London and New York Stock Exchange under the restricted and unrestricted periods of British investment controls. Their empirical results strongly supported LOP for internationally traded stocks after adjustment for exchange rates and transactions costs. They also suggested that LOP is not violated even under a one-sided government that imposes foreign exchange restriction on trade. Wahab et al. (1992) studied arbitrage between ADRs and their underlying stocks followed an implicit pairs trading strategy with two portfolios: one is ADR, the other is underlying home shares portfolio. They sell the 'winner' (portfolio with the highest return over a period of two weeks) and buy the 'loser' (portfolio with the lowest returns over the same two-week period), they found limited profits for their pairs trading strategy when about four per cent transaction costs considered and data limitations. Miller and Morey (1996) examined one of the most heavily traded British stock (Glaxo-Wellcome) that cross-listed in the US using intraday data to test arbitrage on European ADRs and also to investigate the intraday price difference pattern between ADRs and the underlying securities. The results showed that the price difference in these two markets was small and insignificant throughout their two-month sample period, suggesting the market is efficient with respect to arbitrage opportunities. Ding (2000) examined the cross-listed stocks that were traded on the Stock Exchange of Singapore and the Kuala Lumpur Stock Exchange, to see if the two markets are closely linked and the price parity is maintained from the same Malaysian stock traded on both the Kuala Lumpur Stock Exchange and the CLOB.[8] The results showed that the two markets were well linked in terms of their returns and volatility. The markets of Singapore and Kuala Lumpur also confirmed to the law of price reasonably but arbitrage opportunities appeared to exist when stock-broking houses trade for their own accounts. Meanwhile, arbitrage opportunities for other type of investors were significantly diminished due to their high transaction costs.

[8] In the Stock Exchange of Singapore and the Kuala Lumpur Stock Exchange, stocks were cross-listed and traded on both exchanges in their local currencies. However, on 1 January 1990, the cross-listing arrangement was abolished. To facilitate Singaporean investors to trade in Malaysian shares and other foreign shares and to keep the business in Singapore, the Stock Exchange of Singapore set up an over-the-counter market known as CLOB International.

Many stock markets have different trading hours, suggesting that two closing prices must not be equal. A number of studies on LOP cannot be rejected because the cross-listed stocks are indeed one security mainly using daily closing prices with non-overlapping trading time (Maldonado & Saunders 1983; Kato et al. 1991; Park & Tavakkol 1994). Regarding the trading time issue, some of the studies focus on the overlap trading activities and concluded with the arbitrage opportunities. De Jong et al. (2004) evaluated a simple trading rules involving a long position in the relatively underpriced part of the twin shares and shorting an equal dollar amount in the relatively overprices part of the twin shares, they found that this rule produced an abnormal return of up to almost 10 per cent per annum adjusted for systematic risk, transaction costs, and margin requirements.[9] Suarez (2005) analysed the price disparity between the ADRs and their corresponding French stocks and US companies cross-listed in France using high frequency intra-daily datasets as well as the intra-daily French franc/US dollar exchange rates. The sample included top 10 companies that are extensively traded stocks in both markets. This price comparison examination was done on the 1.5 hour overlap of the trading day, when both markets were open. All possible transaction costs were taken into account, and the quotes data rather than trade data were used. The result showed that there was a large deviation from LOP[10], suggesting that an arbitrage trading profits could be made on these large disequilibria. Suarez (2005) also asserts that these markets were disintegrated and not fully efficient as measured by a lack of arbitrage opportunities. Alves and Morey (2003) examined eleven most traded Brazilian ADRs listed on the New York Stock Exchange using the intraday quote price data and the reais/dollar exchange rate, which was taken on an intraday basis during the period when the two stock markets overlap over a one-month period in 2001. The transaction costs for different type of investors were also considered for the arbitrage possibilities. The results showed that there seemed to belittle arbitrage opportunities for the ordinary traders due to higher transaction costs. However, for the Brazilian financial institution, the result showed that there was a profitable arbitrage opportunity available, which the

[9] A twin share is also called Siamese twin, which involves two companies incorporated in different countries contractually agreeing to operate their businesses as if they were a single enterprise, while retaining their separate legal identity and existing stock exchange listings. From this sense, it is lightly different from cross-listing. A well-known example is Royal Dutch/Shell. The shares of the Siamese twin parents represent claims on exactly the same underlying cash flow (Froot & Dobora 1999; Bedi et al. 2003; De Jong et al. 2007).

[10] Suarez's paper established a point estimate for the no-arbitrage band of ±0.563 per cent, inside which a mispricing cannot be profitably arbitraged due to transaction costs and foreign exchange risk. About 2.1 per cent of the observations in their sample were outside this band and they were thus classified as arbitrage opportunities.

Table 3.1: Arbitrage Unavailable Among Cross-listing or ADRs

Reference	Methodology	Sample	Data used	Findings
Lok and Kalev (2006)	Error correction model	38 Australian and 25 NZ stocks that trade concurrently on both markets May 2000 and December 2002	Intraday data set includes the best bid and ask quotes, volume traded, and the exchange rate (New Zealand/Australian dollar), at 5-min intervals. The ASX all ordinaries index, as well as the NZX40 index, are also obtained at 5-min intervals, price series used for this study are mid-quote series	Arbitrage opportunities are not generally available in the trading of the cross-listed stocks on both markets.
Ding (2000)		50 Malaysian companies listed on the CLOB January 2, 1995 to November 30, 1996	Closing stock prices and volume traded, bid and ask exchange rate	The two markets obey the law of one price reasonably but arbitrage opportunities still exist when stock broking houses trade for their own accounts.
Lieberman et al. (1999)	Error correction model (ECM)	Six Israel firms cross listed and traded both in the OTC market of USA and TASE (Tel Aviv Stock Exchange) June 1988 to May 1998	Daily closing prices	Short term arbitrage opportunities are generally not available. There is very strong evidence that all the six pairs of series examined are cointegrated, morever, the estimates of the cointegrating vectors are approximately (1,-1), supporting the hypothesis of no arbitrage opportunities between the two markets.
Ben-Zion et al. (1999)	Error Correction Model	5 Israeli stocks listed on the Tel		Arbitrage opportunities are generally not available
Ding et al. (1999)		a major Malaysian conglomerate, Sime	transactions data and intraday foreign exchange rate data	The raw data appear to indicate the presence of arbitrage opportunities, but none exist after taking
Froot and Dabora (1999)	Regression	Three Siamese twin securities listed both in London SE and NYSE January 1, 1980 to December 31, 1985	Lead and lag daily opening and closing prices	Each company's stock obeys the law of one price
Miller and Morey (1996)		One British security cross-listed in the US	Intraday data set	The price difference pattern between ADRs and the underlying securities are small throughout their 2-month sample period, which indicating that the market is efficient with respect to arbitrage opportunities
Lau and Diltz (1994)		7 Japanese dual listings traded in NYSE and Tokyo Stock Exchange		Arbitrage opportunities is not available
Kato et al. (1992)		ADRs and the foreign stocks: 8 from Australia, 7 from England, and 8 from Japan 1986-1988	Daily closing prices	No significant differences between the prices of these two identical types of claims, no obvious arbitrage opportunities exist between the international capital markets encompassed by this study. There is evidence to be supportive of the law of one price. However, the return correlations between the two identical types of claims, display some interesting patterns. The two returns are not near to being perfectly correlated. This result can be explained, in part, by overlapping time periods for the return calculations. Researchers should be aware of these timing differences that can lead to spurious return-correlation results.
Maldonado and Saunders (1983)	Mean difference and t-ratios	37 U.S. multinational corporation stocks traded on London and NYSE May 1,1979 to April 30, 1980	240 daily closing prices in London and opening prices in New York	The law of one price is strongly supported after adjustment for exchange rates and transaction costs. But the governments' proposing to use dual exchange rate mechanisms and foreign investment taxes on domestic residents in attempt to induce price differences seems failed, unless the foreign arbitrageurs are also restricted.

Table 3.2: Arbitrage is Limited Among Cross-listing or ADRs

Reference	Methodology	Sample	Price used	Findings
Jong et al. (2005)		12 dually listed companies (also called twins)	Daily stock prices, total returns in local currency, bid and ask prices, trading volume, number of shares outstanding	A large deviation from the theoretical price parity. Mean absolute price discrepancies for individual twins range from 4% to 12%. Deviations from parity reach values of over 15% up to 50% for every single dual listed company in the sample. Arbitrage strategies based on the premise that convergence to theoretical parity occurs after large price discrepancies, which produce substantial returns up to 10% per annum relative to Fama-French three-factor model.
		Sample period starts at the date of the merger and ends either 20 days before the announcement date of the share unification or at the last date in the full sample period (October 3, 2002)		But noise traders may cause adverse price movements in the short run, arbitrageurs are not certain before the price convergence, in these situations, margin calls arrived, which force them to liquidate part of the position at a highly unfavourable moment and suffer a loss, therefore, they conclude that risk associated with the volatility of arbitrage returns deters arbitrage activity in those dually listed companies, which consistent with Shleifer and Vishny (1997)
Rabinovitch et al. (2003)	Threshold Autoregressive model	6 locally Argentinean firms, 14 locally Chilean firms and their respective NYSE ADRs 1993 to 2001	Daily returns	The return distributions of Chilean ADRs are significantly different from the distributions of the returns on their respective underlying Chilean shares. But Argentinean ADRs present the same distribution of returns. It is costlier to carry out arbitrage activities in Chile than Argentina. But arbitrage activities that may lead to more efficiency were further impeded by the higher costs of transactions. The 1.37% of return must be added before arbitrage profits could be made in Chile, was 20% higher than in Argentina.

researcher attributed to the special tax laws for financial institutions. Kaul and Mehrotra (2000) studied cross-listed Canadian stocks that were traded in US markets and found that infrequent arbitrage opportunities did exist there, particularly with stock pairs present a combination of relatively low spreads and low trading volume. Studies on arbitrage are summarised in Tables 3.1 to 3.3 list most of the related literature about the arbitrage issue for cross-listings or ADRs.

3.4.3 Reasons Deterring or Limiting Arbitrage

In a perfect capital market, pure arbitrage could exist in its purest form, risk-free and with no capital required. However, in the real world, arbitrage is not without cost. The literature has reported a number of factors that could stop arbitrage activities. The transaction and holding costs are well documented in the literature in relation to the mispricing and arbitrage. Pontiff (1996) argued that mispricing occurs when costs make arbitrage unprofitable using the framework of costly arbitrage to test the closed-end

Table 3.3: Arbitrage Available among Cross-listing or ADRs

Reference	Methodology	Sample	Price used	Findings
Suarez (2005)	Price difference and arbitrage band	10 heavily traded French stocks cross listed in US, and American companies cross-listed in France April 7, 1997 to March 24, 1998	Intradaily data sets, Price comparison is done on the 1.5h overlap trading period	A large deviation from the law of one price observed and an arbitrage trading profits could be made on these large disequilibria.
Alves and Morey (2003)		11 most traded Brazilian ADRs listed on NYSE As of January 2001	Intraday quote price data when two markets overlap with 9373 cases of quote for Brazilian ADR and exchange rate during the same time	Little arbitrage opportunities for the ordinary traders are found since higher transaction costs. However, for the Brazilian financial institution, there is often a profitable arbitrage opportunities available.
Werner and Kleidon (1996)	Intraday pattern(Volume, volatility and spread) analysis	British data:23 British stocks cross-listed on the NYSE or AMEX Us data: 28 British ADRs traded on the NYSE or AMEX January 1, 1991 to December 31, 1991	Transaction and quote data on two hour overlapping trading period	The arbitrage activities set in motion as this new information is incorporated into prices on both sides of the Atlantic produces a relatively stronger concentration of volume toward the overlap for cross-listed stocks
Ip and Brooks (1996)		45 dually traded securities on the Toronto Stock Exchange and NYSE January 1984 to June 1984	Daily closing stock prices	After consideration of commission costs and control for the bid-ask spread and non-synchronous trading effect, there are still apparent violations of price parity integration. Possible arbitrage opportunities remain even with the higher trading cost. But this result could come from inadequate control for non-synchronous trading and poor proxies for total transactions costs. Then violation of the law of one price would be observed even if the markets were integrated.
Wahab et al. 1992	Portfolio approach, controlling for risk differentials between the ADRs and the underlying assets			Arbitrage opportunities could be explored

fund discounts. He found that four factors could affect arbitrage profitability, including the security's fundamental risk that is unrelated to the risk of other securities, the transactions costs from trading the security and the holding cost, the security's dividend yield, and interest rates. Merton's study (1987) revealed that the uncertainty over the nature of an apparent mispricing increase cost, arbitrageurs might be reluctant to incur the potentially large fixed costs of entering the position to exploit the arbitrage opportunity. Lamont and Thaler (2003b) identified a number of technology stock carve-outs in which the market value of the subsidiary was larger than the market value of the parent. They argued that shorting costs prevent rational arbitrageurs from exploiting profitable arbitrage opportunities in these situations.

According to Shleifer and Vishny (1997), Shleifer and Summers (1990), and Delong et al. (1989, 1990), noise trader risk may deter arbitrage in dual-listed companies if

arbitrageurs are specialised professional portfolio managers. In these models, arbitrageurs may be driven out of the market by the possibility of adverse price movements in the short-term, even though it is known that prices will convergence eventually for a number of reasons that relate to capital constraints, unhedgeable or undiversifiable risks, and transaction costs. Further, specialised, professional arbitrageurs may avoid extremely volatile arbitrage positions although such positions offer attractive average returns, the volatility also exposes arbitrageurs to risk of losses and the need to liquidate the portfolio under pressure from the investors in the fund, which also suggests a different approach to understanding persistent excess returns in security prices.

Timing can be another significant issue that stops the arbitrage activity. Kim et al. (2000) suggested that uncertainty induced by non-synchronous trading hours of the ADRs and the underlying security may impede arbitrage activity. Consistent with Kim's findings, Ip and Brooks (1996) also argued that non-synchronous trade phenomenon might be one of the factors that cause price disparity. If trading is thin in either market, the closing price differences can be arising from 'last trades' in each market that occur at different clock times. The observed differences in prices can come from a sale at bid price in one market and a buy at asked price in other market.

Gagon and Karolyi (2010) examined the magnitude of the deviations from parity for 581 pairs of cross-listed/home market shares of stocks from the 39 countries between 1993 and 2002. For most stocks, the prices of the cross-listed shares and those of the home-market shares lie within a 20 to 85 basis point band of each other, but, for some stocks, they can range from a 66 per cent premium to an 87 per cent discount. The results revealed that returns on cross-listed stocks showed significantly higher systematic co-movements with US market indexes and significantly lower systematic co-movements with home market indexes than their equivalent home market shares. This co-movement, while related to country, industry, and firm-specific attributes that reflect institutional barriers to arbitrage, were also influenced by factors that reflect information-based barriers that can impede arbitrage activities.

3.4.4 Cause of Price Disparity

ADRs and their underlying securities may not be perfect substitutes for each other for a number of important reasons. First, they trade in different markets with different trading hours (Rosenthal 1983). Within the paradigm of continuous price parity, it is evident that two closing prices are unlikely to be equal and a price deviation could not be distinguished from a simple price change in the time between the closing of the two markets (Karolyi and Stultz 1996). Meanwhile, according to Chowdhry and Nanda (1991), when a security is traded in different markets, information lags between different trading venues produce short-term disparities in the prices at which the security trades at different locations at any given time, which provides the informed investors with more opportunities to exploit their private information. Therefore, any systematic linkages between the prices of the dually listed stocks may suggest a potential for short-term arbitrage opportunities. Second, although ADRs have some similarities to the underlying securities, international market imperfections could result in some price difference *vis-à-vis* the underlying securities. There is little simultaneous trading between either European and US markets, or the Asian market and US markets. The ADRs trade in the market based on supply and demand when European markets (or US markets) close, and before the Asian markets open. Foreign ownership restrictions can create artificial supply shortages of ADRs when the ownership ceiling is reached. In addition, local owners of the underlying shares are often entitled to tax credits that reduce or eliminate the double taxation of dividends while foreigners cannot obtain these credits (Rosenthal 1983). Foreign companies frequently have rights offerings to raise new capital. SEC of US prevents US holders of ADRs to exercise their rights, which reduce their proportionate claim on the firm (Rosenthal 1983).

Froot and Dabora (1999) suggested that none of those factors (cross-border tax rules, noise effect, country-specific sentiment shocks, discretionary uses of dividend income by parent companies, differences in parent expenditures, voting rights issues, currency fluctuations, ex-dividend-date timing issues, and tax induced investor heterogeneity) affect the twin prices, and stating that twin prices are highly correlated with relative stock-market indexes in the country where each stock is traded most actively. They argued that the mispricing can be a considerable extent to be explained by co-movement of the prices of a twin stocks with domestic stock market indices. For those twin stocks, the relative price of a twin rises (falls) when their domestic market rises (falls). The

price of the ADRs, as well as, the price of the underlying assets is more driven by US consumer sentiment rather than the consumer sentiment of the country of origin. Consistent with the findings, Suh (2003) found that ADR premiums and discounts co-move with aggregate US market returns and not with the market returns in the country of the underlying asset.

Grossmann et al. (2007) have provided some other factors that could cause the price disparity between identical securities traded in different markets. They examined the determinants of ADR mispricing by using a fixed-effects panel data approach. Their results suggested that ADRs with higher transactions costs and lower dividend payments are more likely to exhibit higher price disparity. Further, they find that the premiums on ADRs react in an opposite manner than those on country closed-end funds with respect to consumer sentiment differences between the US and the ADRs' country of origin. That is to say, the more optimistic U.S. consumers are the lower the premiums. This puzzling result can be explained by the fact that both the price of the ADR and the price of the underlying asset are more driven by U.S. sentiment rather than the sentiment in the ADRs' home country.

3.4.5 China Syndrome

It has been documented extensively that when price disparity exists between two classes of shares of the same stock market, the one accessible by foreign investors usually commands a premium over the one restricted only to domestic ownership (Bergstrom & Tang 2001). In the context of China, almost all H-shares, B-shares and N-shares, which are accessible to foreign investors, are traded at a discount to their counterparts in the A-share market on the mainland. However, this should not be seen as an inconsistency because in most other emerging markets, shares accessible by foreign investors are also open to domestic investors, which leaves no opportunity for any discount to exist, while in China, foreign and domestic investors do not have access to each other's market. After the regulatory changes, domestic investors were allowed to trade B-shares after March 2001, the A-share price premium has decreased, and information asymmetry between the two classes of shares (A and B) has decreased dramatically (Ahlgren et al. 2003; Chan, Menkveld & Yang 2003). Regarding the price discount of Chinese overseas listing, five explanations emerged from prior studies. The first is substitute effect (demand and supply). Li et al. (2006) argued that the co-existence of Chinese H-

shares and red chips as alternatives to Chinese B-shares for foreign investors makes the demand for B-shares quite price elastic, leading to low equilibrium prices of B-shares. Hence, unlike other markets, China actually has more than one market available for foreign investors to invest. If the H-share and red-chip markets are attractive enough to foreign capital, the demand for B-shares will then be quite elastic, leading to low equilibrium price of B-shares for a given share supply. Indeed, they find that when more H-shares and red chips are listed in Hong Kong, the B-share discount becomes larger, which is consistent with the model of differential demand elasticity proposed by Stulz and Wasserfallen (1992) who argued that price discrimination in the presence of differences in domestic and foreign investors' demand elasticity explains the price premium observed for foreign-class shares in Switzerland. Domowitz, Glen and Madhavan (1998) confirmed that Stulz and Wasserfallen's model also applies to the Mexican case. They further listed several factors that might explain the price discount phenomena, including currency risk, bond supply, share supply, liquidity, return volatility and expectation to firms' growth rate. Chan, Menkveld and Yang (2003) argued the China A-share premium relative to its counterpart B-share is due to the relative scarcity of supply of A-shares. In an emerging market like China, there are limited alternative investments available to retail investors who are irrational and poorly informed, and have little understanding of the stock fundamental. Therefore, they will bid up the prices of the stocks that are in scarce supply (Chan and Kwok 1996). Yang and Lau (2005) extended the substitution effect of Sun and Tong (2000) and suggested that substitution effect on the China B-share market is not just present in Chinese stocks listed in Hong Kong, but also in Chinese stocks traded in the US market.[11] With a small sample of Chinese firms with B-share cross-listed in both the US and China, Yang and Lau (2005) found the presence of counteracting effect as a result of such listing. The Chinese stocks traded in the US also provide good substitutes for the China B-shares markets. In comparing substitution effects for Hong Kong listings *versus* US listings, the effect was stronger from the US than Hong Kong, which may be attributed to the reasons of being familiarity with and proximity to a stock affecting investors' investment behaviour.

The second reason for Chinese cross-listing discounts is attributed to the ownership restrictions, trading location and investor (market) sentiment. In a recent study, Chan,

[11] Eight out of the 87 companies with both A- and B-shares listed on the same domestic stock exchanges are cross-listed in the US (when firm cross-lists in the US, it may use its B-shares to do ADR listing.

Hameed and Lau (2003) investigated the price behaviour and market activity of the Jardine Group companies after they were delisted from the Hong Kong and moved to Singapore. They found that the Jardine Group stocks are correlated less with the Hong Kong market and more with the Singapore market after the delisting, although their core business remained in Hong Kong and Mainland China. Therefore, the stock price fluctuations are affected by country-specific investor sentiment. There are several other studies that documented the effect of market or investor sentiments. Li, Yan and Greco (2006) presented a consistent result with Froot and Dabora's (1999) finding on the examinations of price differentials between Chinese A-shares and H-shares trading in Mainland and Hong Kong that discounts of H-share prices relative to A-share prices are related to the contemporaneous movements of the H-share local market index relative to the A-share local market index, as well as the spread of savings rates between Hong Kong and Mainland China. Wang and Jiang (2004) examined Chinese companies issue A- and H-shares in both Mainland and Hong Kong China, and found that the H-share and A-share returns have different dynamic relations to their domestic and foreign markets. A-share returns were subject to market-specific risk and investor sentiment that is specific to Shanghai and Shenzhen. H-shares were to market-specific risk and investor sentiment in both Hong Kong and Shanghai and Shenzhen. The large time-varying H-share price discount relative to A-shares was highly correlated with the domestic and foreign stock market indices and relative market illiquidity. In addition, they argued that due to market segmentation, ownership restrictions and exchange control in Mainland China, the H-share discount may not be easily arbitraged away, at least in short-term. Eun and Janakiramanan (1986) considered a two-country world in which foreign investors are constrained to own at most a fraction of the number of shares outstanding from domestic firms. When this constraint is binding, two different prices occur in the equity market, reflecting the premium offered by the domestic investors over the price under no constraints and the discount demanded by the foreign investors. Su (1999) formulated and tested a one-period Capital Asset Pricing Model (CAPM) under ownership restrictions to explain the discounts on foreign-owned Chinese B-shares relative to the prices of domestic A-shares. Under this model, the price difference between A- and B-shares could be expressed by their expected excess returns' difference. He found that the cross-sectional excess to A-share over B-share average return was positively related to A-share market betas and was negatively correlated to B-share market betas and betas with respect to Hong Kong Hang Seng market. He also found that variance of returns and firm size did not appear to affect

returns systematically. The evidence strongly supports market segmentation and price discrimination. Bailey (1994) proposed that the unseasoned or unduly optimism of domestic investors may drive the overpricing of Chinese A-share, which is called 'investor sentiment'. Therefore, the Chinese B-shares traded by foreign investors are sold at discounts relative to A-shares traded by domestic investors. In addition, the lower required returns of Chinese citizens due to the limited investment opportunities might have the discount effect. Bailey (1994) further suggested that since the political and macroeconomic risks peculiar to the B-share markets are undiversifiable to the primary foreign investors, which may add potential risk premiums on B-shares and discount the prices of B-shares heavily as compensation for this systemic risk.

The third explanation lies on the factor of informational asymmetry. Chakravarty, Sarkar and Wu (1998) found evidence for their hypothesis of informational asymmetry in China stock markets using coverage in media as an explanatory variable for the price discrepancy after studying 39 dually listed firms both on Shanghai and Shenzhen. They developed a model that incorporated both informational asymmetry and market segmentation, and derived a relative pricing equation for A-shares and B-shares, and the model-based proxies for informational asymmetry (due to language barriers, different accounting standards, and the lack of reliable information about the local firms, foreign investors have an information disadvantage in trading B-shares relative to domestic investors trading A-shares, the returns on A-shares lead the returns on B-shares) explain a significant portion of the cross-sectional variation of the B-share discounts. Bergström and Tang (2001) extended the study of Chakravarty et al. (1998), and re-examined the price discount of B-shares to A-shares. They found that information asymmetry between domestic investors and foreign investors, illiquid trading of B-shares, diversification benefits from investing in B-shares, and clientele bias against stocks on Shanghai Stock Exchange are significant determinants in this discount phenomenon. Based on a sample of 76 dually listed A- and B-shares from 2000 to 2001, Chan, Menkveld and Yang (2003) examined the effect of information asymmetry on equity prices in the local A- and B-share market in China by constructing several measures of information asymmetry based on market microstructure models, and found that a common explanation for foreign share discount is informational disadvantage; i.e. foreign investors who trade B-shares have an informational disadvantage relative to domestic investors who trade A-shares. Further, the effect of the B-share market being opened to domestic investors in March 2001 has also been investigated to further test

the information asymmetry explanation, and the previous findings about the explanation of information asymmetric were confirmed. By allowing domestic investors to trade in the B-share market, there is less of information disadvantage in this market, and thus the B-share discount becomes relatively smaller. In addition to A-shares and B-shares, price disparity of H-shares and A-shares are examined. Li et al. (2001) found that H-shares lead A-shares because Hong Kong investors have access to market-wide information pertaining to the Chinese stock market ahead of Mainland Chinese investors. This lead-lag relationship increases with the volatility of H-share returns. However, contrary to their findings, Chui and Kwok (1998) suggested that foreign investors receive news about China faster than do domestic Chinese investors because of information barriers in China, suggesting that the direction of information flow was mainly from the B-share market to the A-share market. As a result, the returns on B-shares lead the returns on A-shares. Yet, Chen et al. (2001) suggested that information asymmetric information hypothesis does not provide a convincing explanation for the source of the B-share price discount.

Li and Fleisher (2004) argued that heterogeneous expectations and neglect effect would cause the price discount of Chinese cross-listing. They extended the model of expectations to include multiple classes of investors, and found that heterogeneous expectations in the context of multiple investor classes has significant power in explaining the lower returns and relatively high prices exhibited by China's A-shares. When they consider the role of the neglected share effect in the Chinese foreign-share discount, they identified foreign analysts 'neglect' of B-shares as a significant contributor to the high returns and price discount for these shares relative to their A-share counterparts. Their evidence suggests that 'neglect' increases B-share returns is significant and robust. They also report that the higher the dispersion of domestic analysts' forecasts, the lower are A-share returns, implying that the short-sales restriction is binding for trading in A-shares.

The final reason is the differential risk hypothesis. Eun and Janakiramanan (1986) proposed the differential risk hypothesis, which states that domestic investors and foreign investors have different levels of risk aversion, and that the foreign share price discount relates to the ratio of the aggregate risk aversion of domestic investors to that of foreign investors. Based on this theoretical argument, Ma (1996) suggested that since

Table 3.4: China Syndrome: Price Disparity

Reference	Markets	Sample	Study Period	Factors cause price disparity
Tong et al. (2007)	A-B	90 dual listing A-B	1996-2003	Corporate governance practice
Darrat et al. (2007)	A-B	67 dual listing A-B	1998-2003	Risk level, liquidity, corporate governance, firm size, and differential demand
Lee et al. (2007)	A-B	68 dual listing A-B	1999-2003	Liquidity, relative risk level, supply
Li, Yan, & Greco (2006)	A-H	13 dual listing A-H	1997-2002	Market sentiment (the deviation in the systemic risk premiums of the local markets)
Yang & Lau (2005)	A-B	69 dual listing A-B	1997-2001	Substitution effects (stock traded I the U.S. also provide good substitutes for the China B-shares)
	B-N	8 dual listing B-N		
Chan & Kwok (2005)	A-H	13 dual listing A-H	1991-2000	Information asymmetry, scarce supply of A-share, irrational behavior
	A-B	41 dual listing A-B		
Mei et al. (2005)	A-B	75 dual listing A-B	1993-2001	Investors' speculative motivation
Karolyi & Li (2004)	A-B	75 dual listing A-B	1999-2001	Asymmetric information and differential risk hypothese
Li (2004)	A-B	71 dual listing A-B	1999-2003	Liquidity hypothesis and differential risk hypothesis
Li & Fleisher (2004)	A-B	76 dual listing A-B	1998-2002	Short sales restriction bind for trading in A shares, near- or total absence of non-domestic analysts' forecasts for a significant proportion of companies (neglect effects)
Wang & Jiang (2004)	A-H	16 dual listing A-H	Start list to 2001	Market sentiment (both A an H exhibit significant exposure to local market factors), market illiqu idity
Chan et al. (2003)	A-B	76 dual listing A-B	2000-2001	Information asymmetry
Chen et al. (2001)	A-B	68 dual listing A-B	1992-1997	Illiquid B-share market, relatively illiquid B-share stocks have a higher expected rate of return and are priced to compensate investors for increased trading costs; information asymmetry
Bergström & Tang (2001)	A-B	79 dual listing A-B	1995-1999	information asymmetry between domestic investors and foreign investor, illiquid trading of B shares, diversification benefits from investing in B shares, and clientele bias
Sun & Tong (2000)	A-B, A-H	45 dual listing A-B	1994-1998	Substitution effects, differential demand elasticity; bond supply, share supply, liquidity, and return volatility also have explanatory power but with less importance; currency risk, expectation to firm's growth
		10 dual listing A-H		
Su (1999)	A-B	47 dual listing A-B	1994-1996	Market segmentation and price discrimination, A and B shares return depend on shares' own market betas and betas with respect to the international equity markets, market liquidity
Su & Fleisher (1999)	A-B	24 dual listing A-B	1993-1997	Information asymmetry (less information arrives at B-share markets than at A-share market), large number of investors participating in A-share market
Chakravarty et al. (1998)	A-B	39 dual listing A-B	1994-1996	Informational asymmetry, irrationally high domestic demand for A, foreign investors' sentiment towards the Chinese stocks, interest rate difference between the domestic and foreign markets
Ma (1996)	A-B	38 dual listing A-B	1992-1994	Regulatory changes, different attitude toward risks, speculative environment, B share market has lower liquidity, cost of capital for domestic citizen is lower than foreign investors
Bailey (1994)	A-B	38 dual listing A-B	1992-1994	Market condition, Chinese deposit rate, systematic political risk

Note: A denotes Mainland China Shanghai and Shenzhen A Market, B denotes Mainland China Shanghai and Shenzhen B Market, H denotes Hong Kong Chinese Listing Market, N denotes New York Chinese Listing Market.

China stock markets are speculative, and speculative investors can tolerate higher levels of risk than can foreign investors. Therefore, price discrepancy between the A- and B-

shares can be partially explained by the investors' attitudes towards risks. The summary of Chinese studies is presented in Table 3.4.

3.4.6 Hypothesis Development

Arbitrage opportunities exist when the LOP is violated. There is a rich literature of the arbitrage studies on the dual-listed shares, however, trading time differences, transaction costs, and market restrictions seem deter the arbitrage opportunities. Regardless of the arbitrage restrictions in China A- and B-share market, many of the price disparity observations for the dual-listed Chinese securities in Hong Kong market and New York market contained arbitrage opportunities. Despite of the time difference, foreign exchange rate risk is out of the question because Hong Kong is adopting the fixed exchange rate to US dollars. Therefore, the arbitrage opportunities we investigate in this study are obtained from deviations of prices for the Chinese securities that listed both in Hong Kong and New York. We develop our hypothesis as follow:

- Hypothesis 8: There are arbitrage opportunities for Chinese securities dual-listed both in Hong Kong and New York markets.

3.5 Conclusion

The literature review presented in this chapter reviewed the cross-listing from three major perspectives: corporate governance, multiple listing and informed trading, and price discrepancy. Based on overall review of literature on international cross-listing, it is clear that such listings do not always deliver the exact results as predicted by theory, but in some cases, they are confirmed. However, international cross-listing is a very complex phenomenon, and it requires a deep understanding by government officials, market regulators, corporate CFOs, fund managers, and retail investors.

The topic of corporate governance has been explored in a different context, which is the relationship between corporate governance and bonding theory. From the literature, it is clear that most of the studies about the relationship between bonding theory and corporate governance practice are focused on foreign shares cross-listed on the stock exchanges of US. In reality, foreign shares do also cross-listed in other markets rather than just in the US. This study attempts to deal with the great number of Chinese firms

cross-listed in Singapore, Hong Kong, London, the US, and even Frankfurt stock exchanges. The present study aims to extend bonding theory beyond US markets, and examine whether this bonding mechanism would be effective in the other international markets, in this case, in Hong Kong, Singapore, and London. Therefore, Chapter 4 will empirically examine Chinese cross-listings in the different international markets from the perspectives of corporate governance, firm performance and bonding theory.

The second part of the literature review examined the cross-listing phenomenon from the perspective of market cointegration, price discovery and information flow. Instead of using market indices to explore the market interaction based on the cross-listing, this study uses individual dual- or triple-listed Chinese shares to investigate the relationship between them, and further to the market at large. This is the major difference between this study and the other studies, and the related studies are presented in Chapter 5.

This literature review also examined the price disparity for dual-listed securities in detail, exploring the reason why the price is different for identical securities, examining whether there is an arbitrage opportunity or not. This research will examine the issue of whether Chinese cross-listings that are traded in Hong Kong and New York bring any arbitrage opportunities, which will be demonstrated in Chapter 6.

Chapter 4: Cross-listing, Firm Valuation and Corporate Governance

4.1 Introduction

Bonding theory suggests that due to better and enforceable corporate governance mechanisms applied in the US stock exchanges, cross-listing on a US stock exchange can thus enhance the protection of minority investors for firms coming from the countries that have weak protection of minority rights or poor enforcement mechanisms (Coffee 2002; Fuerst 1998; Stulz 1999). Corporate governance as a set of mechanisms, both institutional and market-based, may induce the self-interested controllers of a firm (including both managers and controlling shareholders) to make decisions that maximise the value of the firm to its owners (Denis & McConnell 2003). While the literature generally supports the bonding hypothesis for US exchanges listings (Coffee 2002), little is known about the application of bonding theory in the context of Chinese firms cross-listed on international stock exchanges. China is an emerging economy that is in the process of transition from a centrally planned to a market economy regime. A well-structured and enforceable legal system and a well functioning financial market are yet to be evident. As Li Rong Rong, the chief of the State Asset Commission of China has stated repeatedly, China will continue to list its large SOEs overseas as one of the strategies to establish modern Chinese corporations (Sun et al. 2006). This raises the question of whether the firms that cross-list their shares in a location that has better corporate governance practices, greater firm disclosure, more stringent financial disclosure level, and stronger minority shareholder rights would outperform those only listed on the Chinese stock exchanges that lack strong enforcement mechanisms to govern stock exchange practices. This research aims to answer this question and to contribute to the body of knowledge in the area of cross-listing in general.

This study uses Chinese firms listed on US exchanges (the New York Stock Exchange and NASDAQ), the Hong Kong Stock Exchange (the Mainboard and Growth Enterprise Market [GEM]), the Singapore Stock Exchange, the London AIM, and both China A and B markets to study the relationship between corporate governance and firm performance as result of cross-listing. The thesis will first examine whether the cross-

listed firms have a higher valuation than the firms listed locally (in A-share market), and then, whether cross-listed firms have bonding effects.

The rest of this chapter is organised as follows: firstly the variables used to test the hypotheses are described. Secondly, data and methods are present, followed by empirical findings. Finally, conclusion and implication are summarized.

4.2 Measurement of Firm Value or Firm Performance

4.2.1 Firm Value or Firm Performance

According to the literature, one of the most extensively used performance measurement in assessing the relationship between firm performance and corporate governance factors is Tobin's *q* (Morck et al. 1988; Hermalin & Weisbach 1988, 1991; Barclay 1989; Lang & Stulz 1994; Zingales 1994; Yermack 1996; Loderer & Martin 1997; Cho 1998; Himmelberg et al. 1999; Holdemess et al. 1999; Claessens et al. 2000; Bhagat & Black 2002). Hovey (2004) examined 38 studies regarding the relationship between corporate governance and firm performance, and found that 21 studies used Tobin's *q*, nine used return on asset (ROA) and eight used return on equity (ROE). In Tobin's (1969, 1978) original formulation, Tobin's *q* captures the ratio of market value to the replacement cost of production assets at the margin. Due to the difficulty of determining the replacement of cost of assets, the proxy for this is typically the book value of assets.

Besides Tobin's *q*, methods for accounting profit such as ROA and ROE as the measurement of firm performance have been used widely, and are also commonly used in the studies of Chinese corporate governance (Demsetz & Lehn 1985; Xu & Wang 1999; Haw et al. 1999; Abdel-Khalik et al. 1999).

Both Tobin's *q* and ROA or ROE tend to suffer from the affects of accounting practices. For Tobin's *q*, as Demsetz (2001) points out, the market value of the firm partly reflects the value investors assign to a firm's intangible assets, yet the estimated replacement cost of the firm's tangible assets does not include investments the firm has made in intangible assets. The firm's future revenue stream is treated as if it can be generated from investments made only in tangible capital. This distorts performance comparisons of firms that rely in differing degrees on intangible capital. Although the different firm performance measures are not without critics, Tobin's *q* is one of the most commonly

used measurements in empirical research in corporate governance (Chung & Pruitt 1994; DaDalt et al. 2002). This study therefore uses Tobin's *q* as the measurement of firm value or firm performance. The firm valuation for each listed Chinese firm was measured by Tobin's *q* and was computed as in Doidge et al. (2004):

$$Tobin's\ q\ = \frac{Total\ Asset\ -Book\ Value\ of\ Equity+Market\ Value\ of\ Equity}{Total\ Asset} \quad (4.1)$$

Where *it* represents Chinese listed firm *i* at the end of December every year from 2003 to 2008. Chinese listed firms include firms listed in China A and B market, HK Mainboard Market, HK GEM, London AIM, Singapore, NASDAQ and New York markets.

All variables in the Tobin's *q* calculation were denominated in the same currency, for example, the data for local Chinese firms are denominated with Renminbi. However, Chinese firms listed in China B market is denominated either with HK dollar or US dollar. And Chinese firms listed in other markets are denominated with Singapore dollar, US dollar and British Pound as well. To make firms across markets more comparable, we eliminated those in the financial sector such as banks, security and investment and insurance companies. The category of the locally listed Chinese firms includes the Chinese firms that only list their shares in China A-share market and the dual or triple-listings are eliminated from this category.

In this study, Tobin's *q* is used as the dependent variable to examine its relationship to the corporate governance mechanisms.

4.2.2 Corporate Governance Mechanisms

This study is focused on the bonding issue. Bonding practices include adopting stringent international accounting standards, having independent directors, having more directors on the board as the Hong Kong stock exchange regulates, and listing shares on foreign stock exchanges. Therefore, this section will discuss the corporate governance variables that should have bonding effects on Chinese overseas listed firms. Besides the bonding corporate governance practices (mechanisms), other corporate governance variables which have identified to have impacts on firm valuation are also examined. The

variables for firm level and corporate governance mechanisms are restricted to those that have been used most often in the literature and details explained follow.

4.2.2.1 Cross-listing

According to the bonding theory, firm cross-lists in international markets especially in US markets to experience an increase in firm value. It should be noted that the Chinese capital market is categorised as a less developed market, and Hong Kong, Singapore, London and US markets as well developed. It is expected that Chinese firms listed in these developed market may enjoy higher firm valuation. A dummy variable is used to represent cross-listings. Following Cai (2007), the dummy variable takes the value of '1' when the Chinese firms are cross-listed in other developed exchanges and the firms listed only on Chinese A-share market are represented by '0'.When the coefficient of this dummy variable is positive, it implies that Chinese firms cross-listed in international capital markets generate a higher Tobin *q*.

4.2.2.2 Firm Size

There is an extant literature that investigates that the relationship between firm size and corporate performance (Banz, 1981; Lang and Stulz 1994; Gilson 1997). The size of the company is used as a proxy to explain bureaucratic inefficiencies brought about due to firm size. Banz (1981) find that small firms generate higher returns than large firms. Lang and Stulz (1994) find a significant negative relationship between firm size and performance. Firm size could be measured by different ways, and Gilson (1997) states that alternative measures do not materially affect the inferences. The log book value of total asset would be adopted as a proxy for firm size in this study. Since this study is dealing with different markets with different currencies, all of the values are expressed by Chinese RMB. Given that there in an increase in the number of private Chinese firms and middle-sized firms listing in international markets, the likelihood of observing a small size effect is high. Most of these listed Chinese firms are SOEs and may be experiencing some management issues. Therefore, we expect firm size have a negative impact upon performance.

4.2.2.3 Growth Rate

In an efficient market, firms with good growth prospects should be valued higher, but sales growth is also affected by a country's institutions and business conditions (Doidge et al. 2007). La Porta et al. (2006), Doidge et al. (2004) use the two years of geometric annual sales growth as the measurement of the growth rate to firm performance. In this study, three-year sales or revenues growth rate is used to be the proxy for growth opportunities as provided by Datastream. And we expect this variable to have a positive impact upon corporate performance.

4.2.2.4 Profitability

Intuitively, a higher profitability rate should be viewed more favourably by the market, hence giving a higher Tobin's *q* (Chen 2005). This study uses the same profitability variable as Chen's (2005) study, which is computed as earnings before interest and tax divided by the total assets. It is expected that profitability has a positive impact upon Tobin's *q*.

4.2.2.5 Leverage

The financial leverage could capture the value of corporate tax shields, which could cause higher values of Tobin's *q* or other performance indicators (Morck et al. 1988). Further, the pecking order theory (Myers & Majluf 1984) states that debt is negatively correlated to the profitability of the firm. The higher the leverage, the greater the risk for the firm, hence the lower value of the firm's value (Brealey et al. 1996). Conversely, as the level of debt increases so too does the incentive for the lender to monitor the firm, leading to better performance (Bebczuk, 2003). Leverage in this study is measured by total debt divided by total asset and is expected to have a positive impact upon Tobin's *q*.

4.2.2.6 Financial Disclosure

Financial transparency and adequate information disclosure is very important for a listed firm as a mean of communication with their shareholders, as such, accounting disclosures are an important corporate governance tool. However, sometimes, managers hide the real story to secure their own interests. Therefore, a well-managed firm should

provide sufficient, accurate and timely information regarding the firm's operating performance, and financial status. After three decades of reform for the Chinese economy, the government realises that the capital market is relying on accurate and complete accounting information to compete effectively with rivals and attract more foreign investors. During the whole process of the accounting reform, Chinese accounting standards are now generally consistent with IAS but with local elements included. Moreover, when a Chinese firm tends to list overseas, it would shift to IAS or another method of accounting and financial disclosure that is accepted by the host stock exchange where they are listing. This study takes a dummy variable that equals 1 if a firm has adopted Generally Accepted Accounting Principles (GAAP), International Accounting Financial Reporting Standard (IFRS), Singapore Financial Reporting Standards (SFRS), and 0 for adopting the local Chinese Accounting Standard. It is expected that Chinese firms adopting international accounting standards have better firm performance than the companies that do not.

4.2.2.7 Auditing

Appointing independent auditing firms is regarded as an essential component of the corporate governance mosaic, and plays an external monitoring role on behalf of the shareholders (Ashbaugh et al. 2003; Cohen et al. 2002). However, the utility of audit services depends upon the quality of auditing. In China, the issue of audit quality has become an immensely important part to the development of the stock markets (Lin & Liu, 2009).

To help the Chinese listed firms improve corporate governance, the CSRC issued rules regarding the adoption of well-known international auditing firms. On 31 December 2001, CSRC issued the Temporary Measure regarding the Additional Auditing Requirement for Listed A-Share Firms. The rule requires the listed firms have their Annual Reports audited by a world renowned accounting firm, which including the so-called Big Five (Arthur Andersen, Deloitte & Touche, Ernst & Young, KPMG Peat Marwick, and PricewaterhouseCoopers). These five accounting firms are the only foreign accounting firms authorised by CSRC to provide auditing service for listed firms. Later, this Big Five became Big Four, since Arthur Andersen was connected to the Enron scandal. CSRC then certified several Chinese firms to provide the additional auditing service.

Since the introduction of the auditing system, the auditing practices have been improved greatly in China, as evidenced by the increasing frequency of the modified and qualified opinions, and more independent status (DeFond et al. 2000). In this study, if a firm has KPMG, Deloitte & Touche, PricewaterhouseCoopers, and Ernst & Young as their auditing firm, we take the value of 1, otherwise 0. A positive relationship with Tobin's *q* is expected.

4.2.2.8 Controlling Shareholder

Concentrated equity ownership can be regarded as a bad corporate governance mechanism since it gives the controlling shareholder more discretionary power to serve his or her own benefits. Prior research has found that controlling shareholders would try to maximise their self-interests through 'tunnelling' behaviours or benefit transfers, thus expropriating other shareholders and related parties' interests (Bai et al. 2004; La Porta et al. 2002; Clasessens et al. 2000; Hess et al., 2010). Copley and Douthett (2002) state that high ownership retention would have an inverse effect on corporate governance because of the agency conflicts induced by this concentrated ownership. La Porta et al. (2002) and Stoughton and Zechner (1998) also suggest that the ownership structure affects the efficiency of corporate governance and thus the intrinsic value of the firm, leading to different corporate performance. Chau and Leung (2006) and Claessens et al. (2000) support the idea that tight control creates an entrenchment problem that allows controlling shareholder self-dealings to go unchallenged internally by the boards of directors or externally by takeover markets. However, Ang et al. (2000) argue that a controlling shareholder may introduce monitoring or bonding mechanisms that limit his or her ability to extract wealth from outside shareholders and hence mitigate the agency conflicts.

In China, ownership concentration is somewhat higher than that in developed countries. Before 2006, almost 70 per cent of listed shares were in the hands of the government or related agencies. Since 2006, ownership reform taken in China has witnessed increased tradable shares in the market, but they still have a large proportion of shares that are held by the government or other state related firms. Liu (2006) states that ownership structure is crucial to the firm's value maximisation, and he proposes that the controlling shareholders employ a feasible governance mechanism to tightly control the listed firms, which is commonly observed among the Chinese listed firms. In this study,

the largest fraction of shares held by one shareholder is used to represent the controlling shareholder. Based on the above, it is not clear at this stage whether the largest shareholder variable will have a positive or negative impact upon corporate performance, this remains to be established empirically.

4.2.2.9 Second Largest Shareholder

An another argument suggests that the degree of concentration of shares held by other large shareholders, excluding the largest one, positively affects firms' performance and market valuation (Liu 2006). The argument of this statement is that when shares are concentrated in the hands of other large shareholders, they are more likely to monitor the largest shareholder and prevent tunnelling a firm's resources. Bai et al. (2004) provide evidence that the concentration degree of shares by the largest shareholders is a good proxy for the likelihood of an emerging a corporate control market, which has been widely touted as an effective external governance mechanism. In this study, the largest proportion of the shares held by the second largest shareholder is obtained to see whether the monitoring effect existed for listed Chinese firms. A positive relationship is expected between the fraction of shares owned by the second shareholder and firm performance due to the motivation provided by this incentive.

4.2.2.10 Duality of the Chairperson and the CEO

Hemailin and Weisbach (2003) proposed that the board of directors is another internal mechanism through which shareholders can exert influence on the behaviour of managers to ensure that the firm is run in their interest. Fama and Jensen (1983) state the concentration of decision management and decision control in one individual reduces a board's effectiveness in monitoring top management. Later, Jensen (1993) confirms that agency problem would be higher when the Chief Executive Officer (CEO) is also the chairperson of the board. Tam's (1999) analysis of the administrative positions held by executive directors reveals the proportion of directors who combine the roles of chairperson and general manager. Ultimately, he argues that boards should be staffed by non-executive directors, because insider control would weaken the function of directors as monitors of the management and harm the long-term interests of shareholders. Goyal and Park (2002), Dahya et al. (2002), and Yermack (1996) find that firms would have higher valuation when the positions of CEO and chairperson are separated. Bai et al. (2004) also find that the CEOs being the chair of the board

negatively affects firm valuation, indicating that increasing the independence of boards of directors helps to enhance firm performance. In China, according to Article 50 of the *Company Law of the People's Republic of China*, the director may concurrently hold the post of the firm's manager. It is very common to see that most chairpersons are also the general manager or CEO of a listed Chinese firm. To capture the effect of the concurrent position for the board of directors, we define CEO and chairperson duality as a dummy variable equal to 1 if the CEO (general manager) is also the chairperson of the board and zero otherwise. It is expected this variable has negative impacts on firm performance.

4.2.2.11 Board Size

A great number of studies have revealed that there is link between the size of the board and corporate performance. Limiting board size is believed to improve firm performance because the benefits by larger boards of increased monitoring are outweighed by less effective coordination and poorer communication and decision-making of larger groups (Lipton & Lorsch 1992; Jensen 1993). Conversely, it is also believed that a larger board size may yield firm benefits by creating a network with the external environment and securing a broader resource base (Pfeffer 1973; Pearce & Zahra 1992). Yermack (1996) and Eisenberg et al. (1998) document a negative relationship between board size and profitability of firms. However, Bhagat and Black (2002) state that the board size and firm performance is not robust to changes in the measurement of performance.

It is well recognised that the Chinese firm have the characteristics of over-representation by the state on the board (Xu & Wang 1999), and the size of the board does not make too much difference. The *Company Law of People's Republic of China* regulates that the board of directors established by a limited liability firm shall comprise three up to 13 members. If a limited liability firm is established by two or more state-funded enterprises or other state-funded investors, the board of directors shall include the representatives of employees of this firm. Article 51 also prescribes that for a relatively small limited liability firm, it may have an acting director and no board of directors. In this study, the board size is measured by the number of the directors (independent directors are included) in the board. Yet, it is hard to expect whether this variable has

positive or negative impacts on firm performance and would depend on the empirical test.

4.2.2.12 Independent Director

Independent directors are often thought to play the monitoring role inside boards, therefore, the most widely discussed question is: do independent directors increase corporate performance? Prior studies make two arguments about the role of the independent directors in the board of directors and firm performance. Jensen (1993) argues that the existence of the independent directors could not reduce the agency costs. Denis and McConnell (2003), Bhagat and Black (2002), and Hermalin and Weisbach (1991) claim that a higher percentage of independent directors is not associated with superior firm performance. However, other studies find that markets do reward firms for appointing outside directors (Baysinger & Butler 1985; Rosenstein and Wyatt, 1990). Hermaliin and Weisbach (2003), Harris and Raviv (2008) conclude that there is a positive relationship between firm profit and the number of independent directors.

The Chinese government has established regulations related to corporate governance in accordance with advanced standards prevalent on an international level. The independent director system is one of them. The role of independent directors features prominently in corporate governance codes. The presence of independent representatives on the board, capable of challenging the decisions of the management, is widely considered a means of protecting the interests of shareholders and, where appropriate, other stakeholders. The Company Law of the People's Republic of China in 1993 regulated the shareholders' meeting, board of directors, board of supervisors and special provisions on the organisational structure of a listed firm, but the independent director system was not included. In 1997, the China Securities Regulatory Commission (CSRC) started to allow the listed firms to set up the independent director based on the firm's own need. Starting from August 2001, CSRC has issued the *Code of Corporate Governance for Listed Firms in China* and the *Guidelines for Introducing Independent Directors to the Board of Directors of* Listed *Firms*. By 3 June 2002, every listed firm in China was required to have at least two independent directors who were to constitute at least one third of the board by 30 June 2003. In this study, the percentage of the independent directors on the board of the firm is used to answer the question of whether establishing an independent director system in China would improve the firm

performance of firms. It is expected that the independent director system has a positive relationship to firm performance. The board of supervisors would be another variable to explain the firm performance and discussed below.

4.2.2.13 Supervisor

Besides the independent director system officially adopted since 2001, there is another mechanism used in Chinese listed firms, which is the board of supervisors. China's Company Law prescribes a corporate governance system for the listed firms through an organisational structure comprising three main constituent bodies: the shareholders' general meeting (or annual general meeting); the board of directors; and the board of supervisors. In China, the board of supervisors and the board of directors are parallel organisations for the listed firm, and responsible for the shareholder meetings simultaneously. This corporate governance structure is modelled after the German two-tier system of an executive board and an oversight supervisory board, with mandatory employees' representation on the supervisory board (Lin 2001). On paper, China's Company Law provides for a comparatively strong and – in theory – effective system of corporate governance of listed firms (Lin 2001).

The board of supervisors have neither resolution rights, nor the ability to appoint and dismiss directors, although the board of supervisors are endowed with supervisory responsibilities (*Company Law of the People's Republic of China*, 1993). Section 4, Chapter 3 of the *Company Law of People's Republic of China* regulates the related responsibilities and duties to the supervisors. The responsibilities of the supervisory committee include the monitoring of whether the directors and senior management have, in the performance of their duties, acted in contravention of any laws, administrative regulations, the Articles of Association or the resolutions passed at general meetings; and reviewing a company's financial information. Supervisors can attend the board meetings.

Since the Chinese regulators did not consider the independent director system while they constituted the *Company Law* in 1993, there is no supervisory limitation left for the other supervision system such as independent director system. Therefore, it is reasonable to assume that there will be conflicts between the board of supervisors and the independent directors if a listed firm has both systems. The *Company Law* doesn't

limit the numbers of the supervisors but it is stated that the board of supervisors shall comprises at least 3 person, which are the representatives of shareholders and the employees of the company at an appropriate ratio. Therefore, this study uses the number of the supervisors in the company to examine whether the existence of the supervisor system improve firm performance and expect a positive impact on Tobin's *q*. Since most of the Chinese firms listed only in Singapore, London and NASDAQ don't have supervisory panel, the examination of the supervisory panel is restricted to HK and China A and B markets.

4.3 Data and Methods

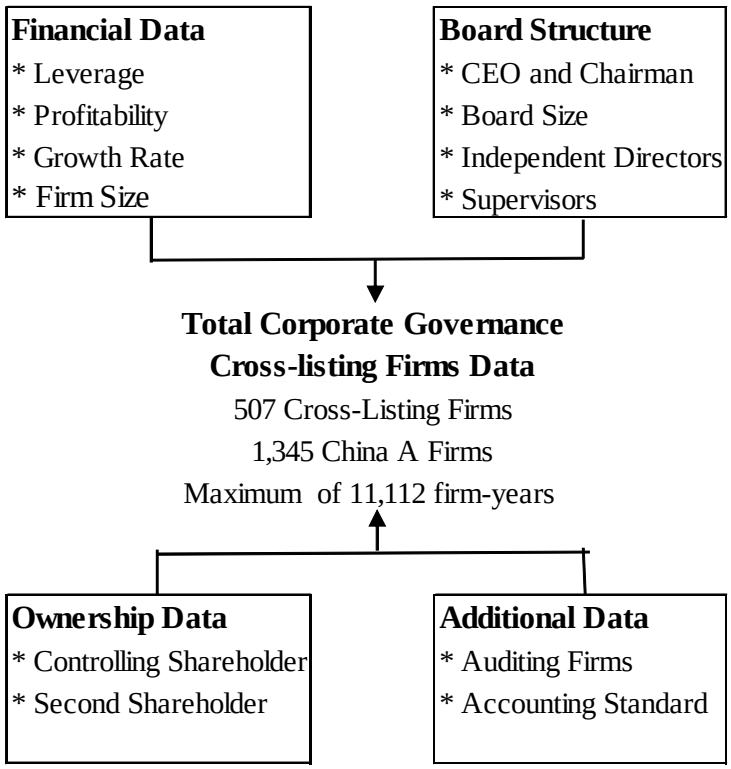
4.3.1 Data Description and Data Structure

To implement the empirical analysis, a panel dataset is assembled referring to a broad cross-section of Chinese firms cross-listed in different markets for the period of 2003 to 2008. The year 2003 was chosen as the base year based on two reasons. First, since 2003 a significant number of Chinese firms have been listing in international stock markets. Secondly, the corporate governance data for locally listed Chinese A firms and Chinese B firms before 2003 are not provided from the GTA database.

Cross-listed Chinese firms' data is obtained mainly from the relevant websites. The primary source of the company information is the stock exchange websites, including that of London AIM, Hong Kong Stock Exchange, Singapore Stock Exchange, and CSRC. The Bank of New York has provided the information of Chinese firms that listed and traded in each exchange in the US, mainly at the New York Stock Exchange, NASDAQ, the American Stock Exchange and OTC markets in the form of ADRs. China B-shares information was obtained from the CSRC website, since the list of B-shares on CSRC was not a complete one, the missing information and data about B-shares were obtained from Datastream. Dual-listed, triple-listed, and cross-listed Chinese firms in China A- and B-share markets, New York, NASDAQ, OTC, Hong Kong and Singapore were eliminated from the whole Chinese listings database so that only the purely locally listed Chinese firms were included. The Chinese firms that are listed on American Stock Exchange were also included although there were only six Chinese listings on the exchange, and were categorised as the cross-listing group of New York Stock Exchange (Appendix 1 presents the detailed Chinese cross-listing information).

The final assembled dataset consists of four blocks of data, namely financial data, board structure, ownership data, and disclosure data which includes auditing firm information and financial disclosure information. The data structure is presented in Figure 4.1.

Figure 4.1: Data Structure



4.3.2 Methodology and Model Specification

Since the data was based on the different listing locations with varied cross-listings in different markets, there may be a possibility that the regression parameters are heterogeneous across these different locations. A simple cross-sectional least square regression of a straightforward pooling of all observations without considering heterogeneity could lead to biased or even meaningless results. Therefore, the use of panel data may be an appropriate way for a systematic and efficient analysis of the corporate governance and firm performance of Chinese cross-listed firms traded in different locations. This is because a panel dataset possesses several major advantages over conventional cross-section or time-series data, which provides more informative data with more variability, less collinearity among the variables, more degrees of freedom and more efficiency (Hsiao 1986; Baltagi 1995).

Based on the argument and discussion for Hypothesis 2 in previous section 3.2.1 (literature review), the following statistical relationship is formulated:

$$Tobin's\ q_{it} = \alpha + \beta_1 crosslisting_{it} + \beta_2 firm\ size_{it} + \beta_3 growth\ rate_{it} + \\ + \beta_4 profitability_{it} + \beta_5 leverage_{it} + \beta_6 financial\ disclosure_{it} + \beta_7 auditing_{it} + \\ \beta_8 controlling\ shareholder_{it} + \beta_9 second\ shareholder_{it} + \\ \beta_{10} chairman\ and\ CEO_{it} + \beta_{11} board\ size_{it} + \beta_{12} independent\ director_{it} + \\ \beta_{13} supervisor_{it} + \varepsilon_{it} \quad (4.2)$$

Where i = 1, 2, …, N, which refers to a cross-section unit (Chinese listed firms), *t* = 1, 2, …, *T,* which refers to time period (2003–2008). The coefficient β measure the sensitivity of the corporate governance of these variables.

In the random effect model, $\varepsilon_{it} = \upsilon_{it} + \omega_{it}$, with υ_{it} and ω_{it} independently normal, var(υ_{it}) = σ_i^2, var(ω_{it}) = θ_i^2. The error are assumed to be heteroskedastic, with firm- and time-specific components, but uncorrelated. The Hausman test tests the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator. Therefore, the null hypothesis is that there is no difference in the coefficients estimated by the efficient random effects estimator and the consistent fixed effects estimator. If there is no difference, then use the random effects model, otherwise, the fixed effects model would be a better option. In determining whether a random or fixed model should be adopted for the regression analysis, we conducted a Hausman test (1978) to determine which specific regression model is more appropriate for this study.

The analysis dataset in this study is a short panel with only six time periods and many individual companies of 1,852 Chinese securities, which would have its consequences for both estimation and inference. The estimators obtained from the fixed-effect model are usually based on the assumption that the idiosyncratic error ~ (0,$_{\varepsilon 2}$). However, this assumption is often not satisfied in panel applications. Therefore, for the short panels in this study, it is possible to obtain cluster-robust standard errors under the weaker assumptions that errors are independent across individual companies and that N→∞. This leads to a cluster-robust estimate of the variance-covariance matrix of the estimators (Gameron & Trivedi 2009).

Although ordinary least square standard errors will be consistent as long as the regression residuals are uncorrelated across both firms and years, such uncorrelatedness is unlikely to hold in a finance panel (Thompson 2009). Meanwhile, the usual standard errors approach does not adjust for correlation between observations with small standard errors that can lead to large t-statistics, and the researcher will see statistical significance even when it does not exist (Petersen 2009). One approach to solve this problem is to cluster along a single dimension. There have been several studies that use cluster robust standard error test to adjust standard errors for correlation along a single dimension (Albertazzi et al. 2009; Thompson 2009). This study clusters at individual Chinese firm level for all the panel data analyses.

To test Hypothesis 3, we create an interaction term between the variable of cross-listing and the bonding corporate governance mechanisms, which the following equation is formulated:

$$Tobin's\ q_{it} = \alpha + \beta_1 crosslisting_{it} + \beta_2 firm\ size_{it} + \beta_3 growth\ rate_{it} + \beta_4 profitability_{it} + \beta_5 leverage_{it} + \beta_6 financial\ disclosure_{it} + \beta_7 auditing_{it} + \beta_8 controlling\ shareholder_{it} + \beta_9 second\ shareholder_{it} + \beta_{10} chairman\ and\ CEO_{it} + \beta_{11} board\ size_{it} + \beta_{12} independent\ director_{it} + \beta_{13} supervisor_{it} + \beta_{14} crosslisting_{it} * financial\ disclosure_{it} + \beta_{15} crosslisting_{it} * auditing_{it} + \beta_{16} crosslisting_{it} * chairman\ and\ CEO_{it} + \beta_{17} crosslisting_{it} * board\ size_{it} + \beta_{18} ccrosslisting_{it} * independent\ director_{it} + \beta_{19} crosslisting_{it} * supervisor_{it} + \varepsilon_{it} \quad (4.3)$$

However, if the interaction term is created by two dummy variables, there might be few 1, which could create the problem of collinearity. For example, the interaction term of cross-listing and financial disclosure might have a collinearity issue to the dependent variable of Tobin's q. To overcome this problem, we focus on the interaction term with the dummy variables and the numeric variables, which formulates the following equation:

$$Tobin's\ q_{it} = \alpha + \beta_1 crosslisting_{it} + \beta_2 firm\ size_{it} + \beta_3 growth\ rate_{it} + \beta_4 profitability_{it} + \beta_5 leverage_{it} + \beta_6 financial\ disclosure_{it} + \beta_7 auditing_{it} + \beta_8 controlling\ shareholder_{it} + \beta_9 second\ shareholder_{it} + \beta_{10} chairman\ and\ CEO_{it} + \beta_{11} board\ size_{it} + \beta_{12} independent\ director_{it} + \beta_{13} supervisor_{it} + \beta_{14} crosslisting_{it} * firm\ size_{it} + \beta_{15} crosslisting_{it} * growth\ rate_{it} + \beta_{16} crosslisting_{it} * profitability_{it} + \beta_{17} crosslisting_{it} * leverage_{it} + \beta_{18} crosslisting_{it} * controlling\ shareholder_{it} + \beta_{19} crosslisting_{it} * second\ shareholder_{it} + \beta_{20} crosslisting_{it} * board\ size_{it} + \beta_{21} crosslisting_{it} * independent\ director_{it} + \beta_{22} crosslisting_{it} * supervisor_{it} + \varepsilon_{it} \quad (4.4)$$

4.4 Empirical Results

4.4.1 Summary Descriptive Statistics

Table 4.1 presents the mean, standard deviation, minimum, maximum, skewness, kurtosis and observation of each variable for Chinese firms that listed in different markets between the periods of 2003 to 2008. Some big numbers appeared when the dataset is constructed. For example, the profitability ratio for Shangdong Zhongrun is -2093.75, and the growth rate is 4114.75 in year 2007. Such large numbers have been excluded from the data analysis[12]. Therefore, two non-cross-listed Chinese companies are dropped from the analysis because of the unusual large numbers. Eventually, data for the 1,345 non-cross-listed Chinese firms and 507 cross-listed firms are gathered based on the data availability. In terms of the firm size which is measured by the total assets (in Chinese RMB), cross-listed firms are smaller than non-cross-listed firms except the firms listed in Hong Kong Mainboard. For the firms listed in Hong Kong Mainboard, the mean of the total assets is the largest in all of the Chinese listed firms. For the firms listed in HK GEM, Singapore, New York, NASDAQ, and London, they have similar size.

Chinese securities that listed on NASDAQ and New York exchanges have the highest Tobin's q ratio with mean value of 3.294 (standard deviation=2.940) and 2.492 (standard deviation=2.208), respectively, reflecting a high market valuation compared

[12]In this analysis, we excluded these large numbers due to the reason of uncertainty. We tracked down the annual reports and the database, wishing to find out whether there is any major acquisitions or some other big events happened, but there is little clue why there are such big numbers. Therefore, these numbers are deleted from the analysis.

Table 4.1: Summary Descriptive Statistics for Variables

This table presents summary descriptive statistics for independent and dependent variables of Chinese securities listed in eight different markets between the periods of 2003 to 2008. Dummy variables are not included.

	Mean	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis	N
China A							
Tobin's Q	2.005	2.621	0.109	134.891	30.494	1399.320	7668
Firm Size	14.259	1.100	5.407	20.991	0.360	2.808	7675
Growth Rate	20.121	37.536	-100.000	973.100	7.622	141.977	6762
Profitability	0.060	0.481	-8.380	39.312	69.887	5783.114	7669
Leverage	0.530	1.028	0.000	82.558	67.691	5306.643	7667
Controlling Shareholder	39.295	16.113	4.490	98.860	0.331	-0.685	6523
Second Shareholder	8.862	7.836	0.003	41.740	0.959	0.163	6523
Board Size	9.540	2.078	1.000	19.000	0.849	1.795	6352
Independent Director	3.281	0.779	1.000	8.000	0.918	2.431	6344
Supervisor	4.121	1.421	0.000	13.000	1.267	2.334	6356
China B							
Tobin's Q	2.112	6.484	0.622	110.230	13.266	190.565	642
Firm Size	14.680	1.239	9.796	18.596	-0.111	0.547	639
Growth Rate	0.143	0.300	-1.000	2.340	1.294	8.257	642
Profitability	0.045	0.180	-2.491	1.823	-2.135	84.039	640
Leverage	1.017	5.285	0.054	96.960	14.107	217.654	642
Controlling Shareholder	38.891	16.689	6.470	82.120	0.175	-0.963	633
Second Shareholder	7.704	7.739	0.080	30.820	1.095	0.323	633
Board Size	9.708	2.230	5.000	18.000	1.086	1.187	627
Independent Director	3.376	0.723	2.000	6.000	1.150	1.054	627
Supervisor	4.172	1.414	2.000	9.000	0.907	0.232	627
HKGEM							
Tobin's Q	1.875	4.642	0.442	65.080	12.966	176.831	198
Firm Size	12.887	0.900	10.896	15.664	0.485	-0.100	222
Growth Rate	0.224	3.039	-9.000	9.000	0.148	2.918	156
Profitability	0.067	0.114	-0.532	0.401	-1.134	4.004	219
Leverage	0.402	0.205	0.059	1.416	1.051	2.233	220
Controlling Shareholder	37.924	18.514	2.200	69.410	0.396	-1.281	201
Second Shareholder	12.756	7.360	1.770	35.990	0.468	-0.286	183
Board Size	9.356	1.947	6.000	17.000	1.174	2.304	202
Independent Director	3.040	0.497	2.000	5.000	0.331	2.010	202
Supervisor	3.950	1.099	3.000	9.000	0.921	1.020	201
HKMainboard							
Tobin's Q	1.404	0.788	0.375	9.562	3.828	26.653	536
Firm Size	16.595	1.991	12.625	23.000	0.899	0.814	651
Growth Rate	0.880	2.261	0.000	9.000	2.487	4.772	476
Profitability	0.177	3.280	-12.734	81.349	24.001	597.677	632
Leverage	0.531	0.237	0.028	1.234	0.200	-0.592	650
Controlling Shareholder	49.729	14.737	12.370	90.000	-0.091	-0.380	541
Second Shareholder	9.357	8.068	0.020	38.380	1.217	1.118	534
Board Size	11.171	2.581	5.000	20.000	0.540	0.233	545
Independent Director	3.765	0.943	1.000	8.000	0.827	1.289	545
Supervisor	4.811	1.887	1.000	12.000	0.935	0.440	545
Singapore							
Tobin's Q	1.667	4.578	0.157	103.919	21.248	474.566	528
Firm Size	12.561	1.657	5.849	18.495	0.330	0.397	693
Growth Rate	0.356	1.041	-0.854	17.081	11.013	161.239	428
Profitability	0.050	2.127	-55.297	1.215	-25.527	664.137	694
Leverage	0.420	0.279	0.021	3.136	2.601	20.220	696
Controlling Shareholder	41.463	15.319	10.577	78.410	0.291	-0.632	541
Second Shareholder	13.692	8.290	0.820	96.500	2.165	17.242	541
Board Size	6.622	1.534	3.000	11.000	0.803	0.103	542
Independent Director	2.782	0.712	1.000	7.000	0.960	3.086	542

	Mean	Std. Deviation	Minimum	Maximum	Skewness	Kurtosis	N
New York							
Tobin's Q	2.492	2.208	0.363	10.454	1.775	2.908	104
Firm Size	14.234	2.348	7.783	19.871	-0.072	-0.357	162
Growth Rate	1.024	2.374	0.000	9.000	2.528	5.275	83
Profitability	0.150	0.440	-1.536	5.121	9.183	109.256	154
Leverage	0.403	0.458	0.030	4.286	6.455	50.556	166
Controlling Shareholder	41.016	24.655	2.500	95.100	0.299	-1.174	85
Second Shareholder	10.431	5.492	1.160	30.440	0.670	1.933	59
Board Size	7.957	2.565	5.000	14.000	0.915	-0.160	94
Independent Director	3.457	1.301	0.000	6.000	-0.639	0.866	94
NASDAQ							
Tobin's Q	3.294	2.940	0.273	18.025	2.342	7.409	101
Firm Size	12.901	1.907	6.958	17.458	-0.171	0.197	159
Growth Rate	0.865	1.538	0.000	7.000	2.300	5.318	74
Profitability	0.046	0.345	-3.420	0.378	-7.537	70.631	153
Leverage	0.286	0.329	0.028	3.503	6.232	57.838	159
Controlling Shareholder	24.592	12.354	6.900	58.800	1.219	0.830	88
Second Shareholder	12.332	6.842	3.300	44.900	1.802	5.442	83
Board Size	6.849	1.769	4.000	13.000	0.811	0.926	93
Independent Director	3.247	1.039	0.000	6.000	0.316	1.327	93
London							
Tobin's Q	2.142	3.672	0.275	37.524	7.765	72.395	122
Firm Size	12.229	2.577	5.049	17.660	-0.333	-0.326	182
Growth Rate	0.819	2.105	0.000	9.000	2.751	6.635	72
Profitability	0.006	0.715	-8.635	1.103	-9.951	117.699	186
Leverage	0.440	0.406	0.006	3.451	2.893	16.249	190
Controlling Shareholder	36.297	22.903	7.100	95.200	0.943	0.056	97
Second Shareholder	13.119	8.496	0.250	40.310	1.065	1.034	92
Board Size	6.363	1.699	4.000	11.000	0.759	0.123	102

to the Chinese securities listed on Hong Kong and Singapore markets followed by Chinese securities listed on London AIM. In terms of the profitability, Chinese firms listed in Hong Kong Mainboard achieved the highest profitability ratio with a mean value of 17.7 per cent, which is followed by the shares listed in New York that generate an average profitability ratio of 15 per cent. Securities listed on China A- and B-share markets and Hong Kong GEM and Mainboard markets all recorded a relative higher leverage ratio (averagely 53 per cent for Chinese A-share listing, 101.7 per cent for Chinese B-share listings, and 53.1 per cent for Hong Kong Mainboard Chinese listings) compared to the rest. The result is expected as the SOEs dominate the stock exchanges in China and Hong Kong Mainboard, and it is well documented that SOEs are expected to have high leverage due to lower cost of borrowing. Chinese securities listed and traded on New York Stock Exchange demonstrated the higher growth rates with mean values of 1.024 after China A-shares.

Chinese firms listed on Hong Kong Mainboard have the largest shareholder who is controlling 50 per cent of the shares of the listed company averagely. Moreover,

Table 4.2: Correlation Coefficient of Variables

This table reports the correlation coefficients among dependent variable Tobin's *q* and independent variables from 2003 to 2008.

	Tobin's q	Firm Size	Growth Rate	Profitability	Leverage	Financial Disclosure	Auditing	Controlling Shareholder	Second Shareholder	Chairman and CEO	Board Size	Independent Director
Tobin's q	1											
Firm Size	-0.153***	1										
	(0.000)											
Growth Rate	-0.033**	0.102***	1									
	(0.002)	(0.000)										
Profitability	-0.292**	0.040***	-0.004	1								
	(0.000)	(0.000)	(0.691)									
Leverage	0.552**	-0.059***	-0.034**	0.163**	1							
	(0.000)	(0.000)	(0.001)	(0.000)								
Financial Disclosure	-0.010	0.051***	-0.152**	-0.023*	-0.004	1						
	(0.316)	(0.000)	(0.000)	(0.020)	(0.674)							
Auditing	-0.033**	0.152***	-0.139**	0.003	-0.025*	0.381**	1					
	(0.003)	(0.000)	(0.000)	(0.772)	(0.015)	(0.000)						
Controlling Shareholder	-0.032**	0.192***	0.037**	0.032**	0.012	-0.000	0.088**	1				
	(0.003)	(0.000)	(0.001)	(0.000)	(0.271)	(0.933)	(0.000)					
Second Shareholder	0.024*	-0.172***	-0.014	-0.016	-0.024*	0.039**	0.110**	-0.374**	1			`
	(0.029)	(0.000)	(0.197)	(0.140)	(0.026)	(0.000)	(0.000)	(0.000)				
Chairman and CEO	0.018	-0.084***	-0.105**	-0.012	0.020	0.365**	0.128**	-0.024*	0.030**	1		
	(0.106)	(0.000)	(0.000)	(0.283)	(0.066)	(0.000)	(0.000)	(0.026)	(0.006)			
Board Size	-0.067**	0.391***	0.058**	0.036**	-0.010	-0.048**	0.018	0.022*	-0.014	-0.098**	1	
	(0.000)	(0.000)	(0.001)	(0.001)	(0.359)	(0.000)	(0.090)	(0.039)	(0.188)	(0.000)		
Independent Director	-0.043**	-0.104***	-0.041**	-0.024**	0.008	0.208**	0.154**	-0.055*	-0.037**	-0.108**	-0.385**	1
	(0.000)	(0.000)	(0.000)	(0.030)	(0.467)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	
Supervisor	-0.045**	0.236***	-0.0032	0.013	-0.016	0.100**	0.118**	0.071**	-0.032**	-0.036**	0.368**	-0.104**
	(0.000)	(0.000)	(0.853)	(0.272)	(0.152)	(0.000)	(0.000)	(0.000)	(0.005)	(0.002)	(0.000)	(0.000)

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

P-Values are in parethesis

NASDAQ has the smallest controlling shareholder, as they only control 25 per cent of the shares on average. Regarding the board size, Chinese securities listed on Hong Kong Mainboard has the largest board size with the mean number of 11, and board size for London, NASDAQ and New York is relatively smaller with the number around 6 to 7.

The number of independent directors for Chinese securities listed on any market is almost the same with the number of 3.5 regardless of the board size. In London market, since they use non-executive directors in the director board, therefore the non-executive are treated as the independent directors in this study.

4.4.2 Correlation Coefficient of Variables

Table 4.2 reports the correlations between the dependent and independent variables for all the listed Chinese firms. It shows that most of the correlation coefficients is smaller than 0.6. As Churchill (1991) suggests, a correlation coefficient above 0.6 is considered high. However, this does not guarantee that there is not serious multicollinearity between the independent variables. The correlation coefficient is further checked with the variance inflation factor (VIF) when performing the regression analysis procedures. The VIF signifies the degree to which each independent variable is explained by the other independent variables, and we found all variables were well below the suggested cut-off point of 10 (Hair et al. 1998).

4.4.3 Cross-listing Premium Empirical Results

Doidge et al. (2004) suggest that cross-listed firms have higher Tobin's *q* than non-cross-listed firms. In line with this argument, we used the information and data presented in Table 4.3 to test Hypothesis 1 by examining the difference of cross-listing premium in different stock exchanges. Table 4.3 reports the firm valuation from year 2003 to year 2008, and the number of firms observed that cross-listed in different markets. The number of firms per stock exchange varies widely especially at the early stage of the cross-listing. For example, there is only two cross-listed Chinese firms in London in 2003, but there are 66 in Hong Kong Mainboard in the same year. There is considerable variation in Tobin's *q* across stock exchanges as well, from a minimum 0.990 in London to 6.570 in NASDAQ.

Table 4.3 shows a mixed outcome. The results show that the Hypothesis 1 is not rejected for the Chinese securities listed in NASDAQ, New York, London, HK GEM, of which the non-cross-listed Chinese firms have averagely higher Tobin's *q* than those non-cross-listed Chinese A-share firms through the entire period of 2003–2008. From the statistical point of view, the mean value of Tobin's *q* for Chinese firms listed at NASDAQ and HK Mainboard is statistically different from the mean value of Tobin's *q*

Table 4.3: Comparison of Valuations of Chinese Firms That Do Not Cross-list and Cross-list by Markets from 2003 to 2008

This table shows summary statistics and the Chinese firms that do and do not cross-list as of 31 December 2003 to 31 December 2008. Financial firms that including banks, insurance companies, security companies, and investment companies are discarded. For Chinese firms listed in other markets, *D(q)* is the difference between the mean *q* for cross-listed Chinese firms and the mean *q* for Chinese firms that are not cross-listed. *N* is the number of Chinese firms. Paired t-statistics are reported between the China A non-cross-listings to the cross-listings in different markets.

		2008	2007	2006	2005	2004	2003	Mean	T-statistics
	N	1344	1337	1281	1252	1246	1208		
China A Non-cross-listing	*Tobin's q*	1.736	3.628	1.886	1.374	1.555	1.751	1.988	
	N	28	32	17	12	9	6		
	Tobin's q	1.290	3.430	3.055	2.863	1.855	1.710	2.367	
New York	*D(q)*	-0.446	-0.198	1.169	1.489	0.300	-0.041	0.379	1.188
	N	26	26	19	16	11	3		
	Tobin's q	1.603	3.130	4.173	3.282	5.287	6.570	4.007	
NASDAQ	*D(q)*	-0.133	-0.498	2.287	1.908	3.731	4.819	2.019	2.367*
	N	42	38	25	10	5	2		
	Tobin's q	0.990	1.973	4.120	1.998	3.576	1.983	2.440	
London	*D(q)*	-0.747	-1.656	2.234	0.624	2.021	0.232	0.451	0.727
	N	111	103	99	82	75	66		
	Tobin's q	1.030	1.960	1.498	1.190	1.304	1.407	1.398	
HK Mainboard	*D(q)*	-0.707	-1.669	-0.388	-0.184	-0.251	-0.344	-0.590	-2.591**
	N	37	37	35	34	31	24		
	Tobin's q	1.078	2.240	1.636	1.272	1.378	4.386	1.999	
HK GEM	*D(q)*	-0.659	-1.388	-0.250	-0.102	-0.177	2.635	0.010	0.018
	N	131	130	101	79	61	27		
	Tobin's q	1.614	1.768	1.803	1.274	1.755	1.860	1.679	
Singapore	*D(q)*	-0.123	-1.860	-0.083	-0.100	0.200	0.109	-0.310	-0.983
	N	107	107	107	107	107	107		
	Tobin's q	2.321	3.478	2.310	1.592	1.359	1.612	2.112	
China B	*D(q)*	0.584	-0.150	0.424	0.218	-0.196	-0.139	0.123	0.907

*Note: * denotes significant at 0.1 level, ** denotes significant at 0.05 level*

of the local Chinese A-share firms. The Chinese firms listed on Hong Kong Mainboard and Singapore markets have lower firm valuation than the firms listed on China A-share market. For all the Chinese overseas listings, investors seem to be willing to pay a higher average bonding premium for the securities that listed on NASDAQ. It has been reported that the best corporate governance of the Chinese firms are probably those non-

state-owned-enterprises that went to public in the USA (Cai 2007). Most of the Chinese firms listed in NASDAQ have decent corporate governance practices and dispersed ownership according to the USA standard. Another possible explanation for the high value of NASDAQ Chinese firms may be based on the path they enter into the market. Most of these firms are funded by venture capital funds provided from venture capitalists in USA. Therefore, when a Chinese firm enters into USA, it is automatically bond itself by having its board, balancing the interests between shareholders and managers of the firm, and monitoring by its venture capitalists. As Cai (2007) suggested, by the time a firm goes public, it already knows how to play the game according to the rules and protecting shareholders' interests, and this has become a part of ownership structure and corporate culture.

However, if just focusing on the Tobin's *q* in the latest two years (2007 and 2008) present in Table 4.3, the Hypothesis 1 is rejected in all of the markets which non-cross-listed Chinese firms have higher Tobin's *q* than those cross-listed Chinese firms in New York, NASDAQ, London, HK Mainboard, HK GEM, Singapore and China B (only in year 2007). Therefore, Table 4.3 does not make it possible to evaluate the significance of the cross-listing premium for cross-listed Chinese firms. To evaluate this significance, the cross-listing premium model stated above (section 4.3.2) is applied to regress Tobin's *q* on a dummy variable that takes value one for Chinese firms with international listing, which includes Chinese securities that listed in London, Hong Kong, Singapore, and US markets. Further, the analysis also determines whether the firm valuation can be explained by firm specific variables and corporate governance mechanisms, which follows in the next section.

4.4.4 Corporate Governance and Firm Valuation Regression Results

This study covers the Chinese firms listed in stock markets of Hong Kong, Singapore, New York, NASDAQ, and London AIM; China A- and B-share markets are also included. The analyses of Chinese cross-listed securities in each different stock market are performed first, followed by the overall analysis of these cross-listed Chinese securities in overseas markets as a whole.

Hausman test is applied here to determine which model to choose. Since the p-value of chi-square test statistics for the coefficients of the fixed effects model and random

effects models are significant with a value of 0.0000, the null hypothesis is rejected by our data and fixed effects regression is preferred in this case. F-statistics also suggest that all the regression models are significant ($p<0.001$). The results for corporate governance practice testing for all the Chinese cross-listed firms are reported in Table 4.4 and are interpreted accordingly.

The fixed effect panel data analysis delivers similar results for the Chinese firms cross-listed in all of the studied markets including China B, Singapore, New York, NASDAQ, Hong Kong GEM, Hong Kong Mainboard, and London AIM, with controlling the China A-share market (Regression 8 from the result table). The coefficients for the variable of cross-listing are negative and significant for China firms listed in Singapore, China B, HK GEM, London and Singapore, which indicates that the non-cross-listed Chinese firms do outperform the cross-listed Chinese firms in these markets. However, the coefficients of the cross-listing for Chinese firms listed in New York and NASDAQ are positive but insignificant, suggesting Chinese firms listed in NASDAQ might have better performance and corporate governance than those non-cross-listed Chinese firms. Therefore, Hypothesis 1 could not be rejected only in New York and NASDAQ markets, which states that Chinese firms cross-listed in New York and NASDAQ have insignificant better firm performance. But results from the relationship between firm performance and corporate governance mechanisms such as supervisor panels, and international accounting standards are ineffective corporate governance mechanisms to increase firm performance. Overall, they do not show bonding effects for Chinese cross-listed securities in this case, therefore Hypothesis 2 is rejected. The detailed discussion is stated following.

Results from the panel data analysis offer strong support that larger listed Chinese firms with more assets have lower Tobin's *q*, the firm size is negatively and significantly correlated to the firm performance in all of the Chinese cases. Chinese firms have longer listing history have better firm performance. Previous studies such as that of Doidge et al. (2004) have identified that the sales growth rate has explanatory power for firm performance. However, in this study, growth rate has failed to explain firm performance. On the contrary, coefficients of the growth rate are negative to the firm performance for all the Chinese listed firms.

Table 4.4: Fixed Effect Panel Data Analysis Results

Table 4.4 reports the corporate governance practice results for the Chinese firms listed in local China A market, and cross-listed in China B, Hong Kong GEM, Hong Kong Mainboard, London, New York, Singapore, and NASDAQ during the period of 2003 to 2008. For regression (1), the examined listed firms are Chinese firms listed in local A-share market and China B-share market. Regression 2 are Chinese firms listed in HK GEM and local A-share market; regression 3: HK Mainboard and local A-share market; regression 4: London and local A-share market; regression 5: New York and local A-share market; regression 6: Singapore and local A-share market; regression 7: NASDAQ and local A-share market; regression 8: All of the international cross-listings and local A-share listings. The dependent variable is Tobin's *q* as the measurement of firm performance. Parameter estimates are reported with robust standard errors in brackets (cluster at individual firm level).

	(1) China A & China B	(2) China A & HKGEM	(3) China A & HK Mainboard	(4) China A & London	(5) China A & New York	(6) China A & Singapore	(7) China A & NASDAQ	(8) China A & All Cross-listing
Cross Listing	-0.511***	-0.172***	-0.271	-1.258	0.672	-1.800***	0.375	-0.939***
	(-2.69)	(-4.53)	(-1.62)	(-1.61)	(1.08)	(-5.25)	(0.50)	(-3.83)
Firm Size	-1.122**	-1.098**	-1.052**	-1.084**	-1.098**	-1.14**	-1.091**	-1.058**
	(-2.09)	(-2.08)	(-2.11)	(-2.09)	(-2.08)	(-2.17)	(-2.10)	(-2.26)
Growth Rate	-0.003*	-0.002	-0.002	-0.002	-0.002	-0.001	-0.002	-0.003
	(-1.80)	(-1.05)	(-1.11)	(-1.06)	(-1.02)	(-0.82)	(-1.02)	(-1.63)
Profitability	4.535**	5.208**	5.206**	5.191**	5.214**	4.349**	5.207**	3.760**
	(2.18)	(2.06)	(2.07)	(2.06)	(2.06)	(2.19)	(2.06)	(2.29)
Leverage	1.382***	3.435**	3.439**	3.427**	3.435**	3.381**	3.438**	1.372***
	(6.815)	(2.26)	(2.26)	(2.25)	(2.26)	(2.20)	(2.26)	(6.73)
Financial Disclosure	-0.3248**	-0.377	-0.165	-0.546**	-0.478*	-0.776**	-0.590**	-0.352***
	(-2.19)	(-1.48)	(-0.86)	(-1.99)	(-1.83)	(-2.35)	(-2.05)	(-2.92)
Auditing	0.263*	0.215*	0.314**	0.364**	0.284*	0.263*	0.288**	0.263**
	(1.93)	(1.68)	(2.24)	(2.26)	(1.93)	(1.83)	(2.02)	(2.19)
Controlling Shareholder	-0.033***	-0.027***	-0.026***	-0.026***	-0.027***	-0.026***	-0.026***	-0.028***
	(-5.28)	(-3.67)	(-3.71)	(-3.64)	(-3.65)	(-3.80)	(-3.72)	(-5.65)
Second Shareholder	-0.038***	-0.037***	-0.035***	-0.037***	-0.038***	-0.036***	-0.038***	-0.031***
	(-4.17)	(-3.99)	(-3.98)	(-4.01)	(-4.07)	(-4.37)	(-4.15)	(-4.55)
Chairman and CEO	-0.087	0.097	0.121	0.107	0.089	0.112	0.086	-0.067
	(-1.22)	(0.66)	(0.84)	(0.72)	(0.60)	(0.78)	(0.58)	(-1.03)
Board Size	0.012	-0.006	-0.004	-0.002	-0.011	-0.010	-0.016	0.002
	(0.42)	(-0.21)	(-0.15)	(-0.09)	(-0.42)	(-0.40)	(-0.60)	(0.10)
Independent Director	1.036	1.286	1.292*	1.660**	1.275	1.731**	0.893	1.259*
	(1.41)	(1.58)	(1.81)	(1.98)	(1.59)	(2.10)	(1.09)	(1.89)
Supervisor	-0.009	0.003	-0.002					
	(-0.18)	(0.05)	(-0.04)					
Adjusted R Square	0.3820	0.2900	0.2885	0.2882	0.2902	0.2724	0.2896	0.3641
Number of Observations	6499	6029	6368	5939	5921	6280	5948	7603

* notes significant at the 0.1 level, ** notes significant at 0.05 level, *** notes significant at 0.01 level.
T-Values are in parethesis

Both the profitability and leverage ratios have positive and significant relationship to the Chinese firms' performance. The higher profitability ratio has been valued by the markets well, and gives rise to a higher Tobin's *q*. The positive and significant coefficients for leverage ratio suggests that the increased leverage ratio does curb the agency problem or improve the management of the firm, as the management of the firms have no incentive to increase the firm value, but to avoid bankruptcy, which is

consistent with the agency costs hypothesis. The agency costs hypothesis states that high leverage ratio reduces the agency costs of outside equity and increases firm value by constraining or encouraging managers to act more in the interests of shareholders (Jensen & Meckling, 1976). After the seminal paper by Jensen and Meckling (1976), a vast literature on agency theoretic explanations of capital structure has developed. As one example of the direction in which the literature has developed, it has been suggested that greater financial leverage may affect managers and reduce agency costs through the threat of liquidation, causing personal loss (Grossman & Hart, 1982; Bolton & Scharfstein, 1990). Similarly, increased leverage may reduce the agency costs of outside equity, so the opposite effect may occur for the agency costs of outside debt arising from conflicts between debt holders and shareholders (Berger & Patti, 2006). Therefore, the empirical evidence on testing the agency costs hypothesis is mixed (See Harris & Raviv, 1991; Myers, 2001 for reviews). However, the empirical result of the positive and significant relationship between leverage and firm performance provides the similar findings to the study of Bai et al. (2004) in China context.

The coefficients of financial disclosure present a mixed result. First, all of the coefficients are insignificant. Overall, Chinese firms adopting the local accounting standard outperformed the Chinese firms cross-listed in international markets. This result might indicate that Chinese firms that adopt local accounting standard could manipulate the financial statement, which might be the reason why the non-cross-listed Chinese firms have better firm performance than those cross-listed Chinese firms. However, the manipulation of the financial statement is beyond this research and could be left for future study. However, hiring Big 4 auditing firms have positive effects on firm performance.

Both the variable of the controlling shareholder and the second largest shareholder have negative and significant relationship with firm performance for all the cross-listed and non-cross-listed Chinese securities, which suggests that the more power the largest shareholder holds, the worse the firm will perform. The result is consistent with the argument that the controlling shareholder can create expropriation (tunnelling) problems (Bai et al. 2004; Clasessens et al. 2000). Moreover, the negative and significant coefficient for the second largest shareholder reflects an ineffective corporate governance mechanism of the Chinese firms; for example, the second largest shareholder could not effectively monitor the controlling shareholders' tunnelling

activities or other possible misbehaviours. The variable of board size is negative or positive but not significant, which reveals that the larger board size might not effectively improve the corporate governance of the Chinese firms. Meanwhile, the duality role of CEO and chairperson has unclear influence to firm performance.

The independent director practice shows no effects on firm performance. Several possible explanations are presented here for this result. First, the establishment of the system of independent directors in China is the product of the government force instead of the natural product of the market development (refer to page 73 for more detailed information of the independent director system in China). Secondly, based on the nature of Chinese independent directors, these independent directors cannot operate independently due to their various relationships with their listed firms (Bai et al. 2004). Under the Chinese cultural circumstances, they might treasure this personal relationship and maintain a harmonious working environment instead of honouring their fiduciary obligations. Lack of proper financial incentives for the independent directors and required knowledge of these independent directors (Such, compared to the more developed countries, they may lack legal knowledge) to the listed firm may have restricted them from making reasonable decisions. Further, the insiders in the firm limit their ability to play a role in the listed firm.

The supervisory system as a supposedly corporate governance mechanism has no obvious effects on firm performance in China A- and B-share market and Hong Kong markets. This supervisory board is small and usually has labour union and major shareholder representation, but does not hold any authority to monitor operational and strategic firm behaviours (Tam 2002). This study indicates that this specific corporate governance mechanism plays no specific role in the Chinese context. Therefore, it remains unclear whether the supervisory board has any effective role in representing the interests of employees and other stakeholders, or other benefits.

4.4.5 Interaction of Cross-listing, Corporate Governance and Firm Valuation Regression Results

Following the studies worked through earlier, Table 4.5 mainly presents the relationship between firm valuation and bonding corporate governance mechanisms via listing locations.

The interaction term between cross-listing and the different corporate governance mechanisms have different impacts on firm valuation. Clearly, Chinese firms listed in London with bigger firm size and board size have better firm performance. However, firms with higher profitability, higher growth rate and higher leverage ratio have lower firm performance in London market. Chinese firms listed in New York have a similar situation, with firms having higher growth rate and higher leverage ratio normally have lower performance. But bigger firms listed in New York with higher profitability have better firm performance. In addition to this, firms listed in New York with larger controlling and the second largest shareholders have better performance. Unlike the London market, firms with bigger board size listed in New York have lower firm performance.

Chinese firms listed in NASDAQ tell another story. Firms with bigger second largest shareholder, less board members and less independent directors could have better performance. In the Singapore market, firms with high growth rate, larger controlling and second large shareholders have better performance. However, higher profitability, higher leverage ratio and more independent directors would lower the firm performance. The combined effect of cross-listing and corporate governance practices have no obvious effect on the Chinese firms listed on HK GEM. The positive and significant coefficient for the interaction term of cross-listing and the firm size, growth rate, controlling shareholder, and the second largest shareholder indicates that Chinese firms listed on HK Mainboard have better firm valuation than those non-cross-listed Chinese firms. The presence of a positive and significant interaction term between cross-listing and the board size in China B market indicates that the listed Chinese firms in China B markets have better firm valuation.

Overall the most obvious interaction term is the cross-listing and the controlling shareholder and the second largest shareholders. For all of the overseas Chinese listings, the greater proportion of shares held by these two biggest shareholders the better the firm performance for these Chinese firms cross-listed in overseas markets. Therefore, Hypothesis 3 could not be rejected in most of the cases, which suggests that when Chinese firms cross-listed in international markets, different markets have different effective corporate governance practices to improve firm performance.

Table 4.5: Interaction Results for Cross-listing, Corporate Governance and Firm Valuation

Table 4.5 mainly reports the effects of interaction term between cross-listing and other bonding corporate governance mechanisms on Chinese firm performance during the period of 2003 to 2008. For regression (1), the examined listed firms are Chinese firms listed in the local A-share market and China B-share market. Regression 2 are Chinese firms listed in HK GEM and local A-share market; regression 3: HK Mainboard and local A-share market; regression 4: London and local A-share market; regression 5: New York and local A-share market; regression 6: Singapore and local A-share market; regression 7: NASDAQ and local A-share market; regression 8: All of the international cross-listings and local A-share listings. The dependent variable is Tobin's *q* as the measurement of firm performance. Parameter estimates are reported with robust standard errors in brackets (cluster at individual firm level).

	(1) China A & China B	(2) China A & HKGEM	(3) China A & HK Mainboard	(4) China A & London	(5) China A & New York	(6) China A & Singapore	(7) China A & NASDAQ	(8) China A & All Cross-listing
Cross Listing	-4.236	-5.981*	-9.136***	-4.752	-10.582*	-9.569***	3.741	-8.384***
	(-1.62)	(-1.93)	(-3.77)	(-1.50)	(-1.85)	(-3.71)	(0.47)	(-3.31)
Firm Size	-1.107**	-1.106**	-1.106**	-1.096**	-1.096**	-1.095**	-1.096**	-1.096**
	(-2.07)	(-2.07)	(-2.07)	(-2.07)	(-2.07)	(-2.07)	(-2.07)	(-2.30)
Growth Rate	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(-1.03)	(-1.03)	(-1.03)	(-1.02)	(-1.02)	(-1.02)	(-1.02)	(-1.03)
Profitability	5.218**	5.214**	5.214**	5.213**	5.212**	5.213**	5.213**	5.217**
	(2.06)	(2.06)	(2.06)	(2.06)	(2.06)	(2.06)	(2.06)	(2.06)
Leverage	3.432**	3.434**	3.435**	3.436**	3.436**	3.436**	3.436**	3.433**
	(2.25)	(2.25)	(2.25)	(2.25)	(2.25)	(2.25)	(2.25)	(2.25)
Financial Disclosure	-0.511***	-0.495*	-0.221	-0.579**	-0.581**	-0.505**	-0.581**	-0.465***
	(-4.03)	(-1.94)	(-1.18)	(-1.98)	(-1.97)	(-2.35)	(-1.97)	(-4.64)
Auditing	0.285**	0.213	0.304**	0.300**	0.281*	0.273*	0.279*	0.249**
	(1.97)	(1.61)	(2.22)	(2.04)	(1.93)	(1.94)	(1.93)	(2.13)
Controlling Shareholder	-0.027***	-0.027***	-0.027***	-0.027***	-0.027***	-0.027***	-0.027***	-0.027***
	(-3.65)	(-3.65)	(-3.65)	(-3.65)	(-3.65)	(-3.65)	(-3.65)	(-3.64)
Second Shareholder	-0.039***	-0.038***	-0.039***	-0.039***	-0.039***	-0.039***	-0.039***	-0.039***
	(-4.04)	(-3.99)	(-4.03)	(-4.03)	(-4.02)	(-4.03)	(-4.02)	(-4.06)
Chairman and CEO	-0.086	0.093	0.107	0.094	0.090	0.085	0.083	-0.100
	(-1.19)	(0.63)	(0.74)	(0.64)	(0.61)	(0.59)	(0.56)	(-1.53)
Board Size	-0.008	-0.005	-0.004	-0.010	-0.010	-0.010	-0.010	-0.014
	(-0.30)	(-0.17)	(-0.16)	(-0.37)	(-0.37)	(-0.38)	(-0.38)	(-0.51)
Independent Director	1.307	1.300	1.307	1.300	1.296	1.299	1.296	1.308
	(1.61)	(1.60)	(1.61)	(0.811)	(1.60)	(1.60)	(1.60)	(1.62)
Supervisor	0.003	0.001	0.001					
	(0.05)	(0.01)	(0.01)					
Cross-listing * Firm Size	0.591	0.703	0.914*	1.400**	20.849***	0.385	-0.038	0.519
	(1.06)	(0.43)	(1.68)	(2.26)	(44.17)	(0.68)	(-0.05)	(0.96)
Cross-listing * Growth Rate	-0.109	0.040	0.463*	-3.986*	-2.255***	0.187*	0.934	0.147
	(-0.46)	(0.43)	(1.81)	(-1.92)	(-117.22)	(1.74)	(1.26)	(1.39)
Cross-listing * Profitability	-2.385	-2.567	-2.862	-9.728**	124.771***	-4.860*	-8.456	-4.214
	(-0.90)	(-0.92)	(-1.03)	(-2.26)	(30.26)	(-1.92)	(-1.24)	(-1.61)
Cross-listing * Leverage	-2.210	-1.449	-2.507	-4.175*	-46.710***	-2.178	2.532	-2.247
	(-1.45)	(-0.88)	(-1.51)	(-1.80)	(-29.38)	(-1.35)	(0.70)	(-1.47)
Cross-listing * Controlling Shareholder	0.038***	0.011	0.022**	-0.027	1.654***	0.029***	-0.037	0.024***
	(3.33)	(0.60)	(2.46)	(-1.08)	(55.31)	(3.38)	(-0.99)	(2.85)
Cross-listing * Second Shareholder	0.061***	0.040*	0.052***	-0.044	1.521***	0.030**	0.069**	0.037***
	(3.02)	(1.76)	(3.52)	(-0.96)	(49.12)	(2.58)	(2.37)	(3.12)
Cross-listing * Board Size	0.168**	-0.045	-0.018	0.607**	-0.920***	0.022	-0.570*	0.042
	(2.00)	(-0.78)	(-0.51)	(2.20)	(-13.01)	(0.30)	(-1.95)	(0.93)
Cross-listing * Independent Director	0.171	-1.976	-1.180	8.313	15.330***	-2.262**	-12.727*	-1.281
	(0.10)	(-1.12)	(-1.15)	(1.61)	(11.99)	(-2.09)	(-1.69)	(-0.96)
Cross-listing * Supervisor	-0.110	0.206	-0.008					
	(-1.10)	(0.71)	(-0.10)					
Adjusted R Square	0.4350	0.2903	0.2898	0.2911	0.2909	0.2896	0.2910	0.4279
Number of Observations	6499	6029	6368	5939	5921	6280	5948	7603

* notes significant at the 0.1 level, ** notes significant at 0.05 level, *** notes significant at 0.01 level.
T-Values are in parethesis

4.4.6 Robustness Test

A series of sensitivity tests are conducted to examine the robustness of the regression model and the empirical results. The examined period of this study covers 2003 to 2008, however, the global financial crisis occurs in 2008. When the crisis hit, firm performance might be affected. To avoid any bias due to the global financial crisis, we cut 2008 data from the whole data set and just focus on the period of 2003 to 2007 to conduct the robustness test. The same measurements of the variables are used, and the same panel data analysis is adopted as well as to check the robustness of the findings.

Table 4.6 present the robustness test results. Overall, the evidence is consistent with the results present in Table 4.4. Although auditing variable from 2003 to 2007 loses its statistical significance, its economic significance is the same. And the independent director variable has stronger effects on firm performance before year 2008.

4.5 Conclusion

As the largest and fastest growing emerging market, China's equity market is labelled as a young capital market with short history and lack of quality of listed companies, weakness in enforcement of laws and rules, and a need for better corporate governance. Since 2000, more and more codes and guidelines are issued by the Chinese government and CSRC, aiming to develop the corporate governance practices in China. In addition to these new developments of corporate governance in China, encouraging the Chinese firms to cross-list their shares in international equity markets becomes an additional way to improve the corporate governance for listed Chinse firms.

This study set out to examine the corporate governance and cross-listing in the context of Chinese firms listing in Hong Kong, US, Singapore, London, and the local B markets as well as the domestic China A-share market. It considers the extent to which these cross-listed Chinese firms can successfully borrow foreign corporate governance elements to improve their corporate governance system. The empirical results from the study reported in this study reveal a mixed result for Chinese securities listed in different stock exchanges. Chinese firms listed on NASDAQ show a higher valuation (Tobin's *q* recorded as averagely 4.007 during the examined 6 years) when compared to

Table 4.6: Robustness Test

Table 4.6 reports the robustness test for corporate governance practice results for the Chinese firms listed in local China A market, and cross-listed in China B, Hong Kong GEM, Hong Kong Mainboard, London, New York, Singapore, and NASDAQ during the period of 2003 to 2007. For regression (1), the examined listed firms are Chinese firms listed in local A-share market and China B-share market. Regression 2 are Chinese firms listed in HK GEM and local A-share market; regression 3: HK Mainboard and local A-share market; regression 4: London and local A-share market; regression 5: New York and local A-share market; regression 6: Singapore and local A-share market; regression 7: NASDAQ and local A-share market; regression 8: All of the international cross-listings and local A-share listings. The dependent variable is Tobin's *q* as the measurement of firm performance. Parameter estimates are reported with robust standard errors in brackets (cluster at individual firm level).

	(1) China A & China B	(2) China A & HKGEM	(3) China A & HK Mainboard	(4) China A & London	(5) China A & New York	(6) China A & Singapore	(7) China A & NASDAQ	(8) China A & All Cross-listing
Cross Listing	-0.324	-0.663***	-0.224	-1.001	1.118	-1.892***	0.915	-0.913***
	(-1.17)	(-3.29)	(-1.13)	(-0.91)	(1.30)	(-4.20)	(1.02)	(-3.74)
Firm Size	-1.392	-1.246	-1.225	-1.290	-1.301	-1.208	-1.292	-1.121
	(-1.56)	(-1.50)	(-1.42)	(-1.45)	(-1.45)	(-1.46)	(-1.45)	(--1.50)
Growth Rate	-0.004	-0.004	-0.004	-0.003	-0.003	-0.003	-0.003	-0.004
	(-1.46)	(-1.52)	(-1.51	(-1.44)	(-1.42)	(-1.48)	(-1.43)	(-1.53)
Profitability	4.711**	4.702**	5.426**	5.424**	5.425**	5.265**	5.423**	4.497**
	(2.06)	(2.07)	(1.99)	(1.98)	(1.98)	(2.03)	(1.98)	(2.11)
Leverage	1.489***	1.501***	3.466**	3.451**	3.453**	3.491**	3.456**	1.515***
	(4.56)	(4.55)	(2.21)	(2.20)	(2.20)	(2.21)	(2.20)	(4.51)
Financial Disclosure	-0.833***	-0.749***	-0.335**	-1.055**	-1.079**	-1.066**	-1.078**	-0.777***
	(-4.20)	(-4.08)	(-1.99)	(-2.27)	(-2.25)	(-2.39)	(-2.27)	(-4.60)
Auditing	0.262	0.222	0.335	0.307	0.266	0.246	0.280	0.221
	(1.26)	(1.26)	(1.63)	(1.42)	(1.26)	(1.22)	(1.34)	(1.33)
Controlling Shareholder	-0.052***	-0.049***	-0.045***	-0.046***	-0.47***	-0.43***	-0.464***	-0.044***
	(-4.67)	(-4.75)	(-3.94)	(-3.89)	(-3.95)	(-4.25)	(-3.99)	(-5.32)
Second Shareholder	-0.074***	-0.067***	-0.069***	-0.072***	-0.075***	-0.071***	-0.075***	-0.063***
	(-5.55)	(-5.52)	(-5.20)	(-5.04)	(-5.13)	(-5.42)	(-5.17)	(-5.81)
Chairman and CEO	-0.122	-0.067	0.152	0.113	0.102	0.117	0.094	-0.103
	(-1.10)	(-1.04)	(0.68)	(0.49)	(0.44)	(0.51)	(0.40)	(-0.99)
Board Size	0.012	0.009	-0.008	-0.019	-0.022	-0.021	-0.024	-0.003
	(0.30)	(0.27)	(-0.23)	(-0.48)	(-0.56)	(-0.57)	(-0.60)	(-0.08)
Independent Director	1.781*	1.774**	2.102**	2.274**	2.141**	2.112**	2.036*	1.859**
	(1.77)	(2.00)	(2.27)	(2.18)	(2.05)	(2.28)	(1.95)	(2.40)
Supervisor	-0.061	-0.048	-0.029					
	(-1.01)	(-0.87)	(-0.46)					
Adjusted R Square	0.3510	0.3468	0.3043	0.3061	0.3067	0.3014	4846	0.3402
Number of Observations	5316	5789	5179	4839	4828	5094	5948	6141

* notes significant at the 0.1 level, ** notes significant at 0.05 level, *** notes significant at 0.01 level.
T-Values are in parethesis

the other markets and non-cross-listed Chinese firms. However, the corporate governance regression results indicate that the non-cross-listed Chinese firms have better firm performance compared to those cross-listed. Further, establishing the supervisory panel is not related to firm performance or corporate governance practices. The same is the case of adopting international financial accounting standards, and borrowing the independent director practice from the developed countries' corporate

governance system. However, having the Big Four auditing firms to monitor the financial statement does have an influential effect on firm performance.

The study findings may generate some thoughts for the different stakeholders of the Chinese listed firms, especially the investors and market regulators. First, listing internationally for some Chinese firms (Such as Chinese firms cross-listed in Hong Kong, Singapore, and London) by adopting the related corporate governance mechanism does not mean that they improve their firm performance, although some of the rules and mechanisms required by the host exchange do have a significant effect on firm performance such as by hiring famous international auditing firms to monitor their financial disclosures. By looking at the combined effects of cross-listing and corporate governance mechanisms, we find that different stock markets have different effective corporate governance systems to improve firm performance. There is no single model of good corporate governance, and each system has their strengths, and weaknesses. Secondly, it is worthwhile to point out that the equity market environment in China has some distinct features compared to most developed countries. For instance, there are still a large number of cross-listing firms that are SOEs where the government exercises substantial control over the operations of these listed firms. In addition, the corporate governance practices from the developed culture may not be fully realized in a relatively less efficient capital market in China, which is why we see the cross-listed firms generally do not outperform those non-cross-listed. Therefore, the effects of different environmental factors should be taken into account when compared the corporate governance practices in China to the developed countries.

The findings of this study suggest that improving corporate governance is not just borrowing or copying the corporate governance mechanisms from elsewhere. The effectiveness of different corporate governance mechanisms varies depending on the countries' legal and regulatory framework, historical and cultural factors. At the national level, it may be too early to judge the success of the financial market and corporate governance reforms undertaken by Chinese authorities. Nonetheless, in line with the continuing progress of the economic reforms and business environment changes, the corporate governance experiences for China firms should be further improved.

In summary, the corporate governance issue in China is complicated. China's gradual corporatisation approach towards 'a social market economy with Chinese characteristics' has been proved an economic miracle. However, China's corporate governance that emerged from these characteristics seems to be far from satisfactory. Cross-listing as a supposed effective way to improve firm performance by adopting the more stringent disclosure and having more enforceable market mechanisms lacks any consistent or powerful explanation for firm performance improvement. The empirical results presented above are consistent with Licht's (2004) argument that, while cross-listing might erode some of the Chinese firms' national features, it cannot eliminate them, adding a layer of foreign rules cannot remedy deeply-rooted deficiencies in firm governance.

This chapter has examined the overall Chinese cross-listing issue from the perspective of corporate governance. The next chapter will shift focus from a macro-perspective to a micro-perspective by investigating the return and price behaviour of each dual- or triple-listed Chinese security that traded in different markets.

Chapter 5: Market and Price Linkage for Dual-listing

5.1 Introduction

The financial market liberalisation and the opening of capital markets in China results an increasing international portfolio investment. Many empirical studies of international portfolio investment document the long-run benefits from international equity diversification (Taylor & Tonks 1989; Le 1991; Chan et al. 1992). According to these studies, asset prices in two different capital markets cannot be cointegrated, which means one stock price cannot be predicted from the other stock price; if it is, either there are no gains from international portfolio diversification, or the markets are not efficient or integrated. The China stock market as an emerging market gives international fund managers an opportunity for portfolio diversification. Under the current law, Qualified Foreign Institutional Investors (QFIIs) with at least $10 billion in management have been allowed to buy up to 10 per cent of a Chinese company's shares (still held in Chinese currency) from China A-share markets directly. There are also several other Chinese choices for fund managers for portfolio diversification, including B-shares, H-shares, N-shares, and Chinese securities listed in other foreign markets, such as that of London, Frankfurt and Singapore. This provides academics with an interesting and significant research context to explore the interdependence of the different types of shares that are listed and traded in different capital markets.

However, prior studies for international Chinese listings have focused on market segmentation, especially for China A-share market and Hong Kong H-share market (Chong & Su 2006; Lin & Wu 2006), interactions among China-related market indices (Kim & Shin 2000), cross-listed price discount for China B-shares to A-shares (Ma 1996; Yang & Lau 2005), price discount of H-shares to A-shares (Wang & Jiang 2004) and price discovery process for H-shares to N-shares (Su & Chong 2007, Chen et al., 2010). Little is documented on the interdependence of the dual or triple cross-listings among Mainland China, Hong Kong and the US. Due to the different classes of shares regime, shares issued by the same Chinese company could be traded in different markets and by different groups of investors. In the context of the dual-listed Chinese firm, since both of the A- and B-shares, or A- and H-shares, even A-, H-, and N-shares are issued by the same underlying Chinese firm, in an ideal environment in which

markets are efficient, any information regarding firm-specific and common market factors should be reflected in the prices of both A- and B-shares, A- and H-shares, or A-, H-, and N-shares, causing the same degree of price changes simultaneously (Kim & Shin 2000). Further, with the opening of the A-share market to the Qualified Foreign Institutional Investors since the end of 2002, market information processing and transaction executing are assumed to be improved in China A-share market accordingly.

Therefore, the study reported in this chapter is to test the Hypotheses 4, 5, 6, 7 and 8. We will preliminary examine the return behaviour among Chinese dual-listings traded in Hong Kong, New York and Mainland China (A-share and B-share markets are included), further to study the market co-movement. Cointegration analysis, Granger causality test, and error correction model are also applied to investigate the price linkage. By conducting the cointegration analysis, we can discover whether there is any improvement about the market integration between Chinese markets and the other markets. By conducting causality or lead-lag relationship and error correction model among the multiple classes of Chinese shares, we can discover which market or group of investors is more efficient in obtaining and processing relevant information and trading upon it.

The rest of the chapter is organized as following. We first present the data in section 5.2, followed by the descriptions of methodologies in section 5.3. In section 5.4, we present all of the empirical results; conclusions follow in section 5.5.

5.2 Data Collection

5.2.1 Chinese Dual and Triple Listing Introduction

At the infant stage of the Chinese stock markets in 1990s, to attract international investors and to avoid the shortcomings of the domestic stock markets, the Chinese Government chose state-owned Chinese companies with the best financial integrity and corporate governance practices to list their shares on the New York Stock Exchange and Hong Kong Stock Exchange (Mak et al. 2005). Therefore, to issue foreign shares first with the attempt to extract beneficial information from foreign investors was seen as a strategy to foster the A-share markets and help firms better evaluate A-shares.

A Chinese firm could just list its share in the domestic A or B-share market, or it could list in international markets without listing domestically, or listing its shares both in domestic and international markets. Chinese cross-listing that occurred in the early 1990s witnessed some reputable and large Chinese firms listed and traded in both the Hong Kong and New York markets. Along with China's gradual liberalisation in the financial markets, these reputable firms returned to the China A-share market to improve the regulatory quality and maintain positive market sentiment (Megginson & Tian 2007). Since 2004, more and more Chinese companies have started to adopt a new model of listing, the A+H model, which is to dual-list their shares on the Mainland China domestic exchange as A-share and H-shares on the Hong Kong Stock Exchange simultaneously with the same IPO price. During the early period of 2000s, the large state-owned Chinese firms that previously listed and traded in overseas markets started to list back the domestic A-share market. One of the most successful dual-listing firms that adopted the model A+H was the Industrial & Commercial Bank of China that has the largest public listing in history with a $22 billion IPO in 2006. Appendix 2 presents these cross-listings' company information including the name, industry, and the listed date.

5.2.2 Data Collection

In this study, we only focus and study the dual and triple-listed Chinese shares to the end of 2008, which includes dual-listed Chinese A- and B-shares, dual-listed Chinese A- and H-shares (Chinese shares listed in Hong Kong market), and triple listed Chinese A-, H-, and N-shares (Chinese shares listed in New York, Chinese shares traded on the OTC market are excluded) with a total number of 132 dual and triple Chinese listings. Daily total return index (RI) for all the dual and triple listed Chinese shares are collected from 1st January 1993 to 31st December, 2008. Eventually, there are 77 pairs of Chinese A- and B-shares, 41 pairs of Chinese A- and H-shares, 11 triple-listings traded in China A, Hong Kong, and New York markets. There have another three dual-listed Chinese shares that are listed and traded only in the Hong Kong and New York markets in this category. In general, the sample period for each individual company started from the same trading date in their respective listed markets from 1993 through to the end of 2008. Therefore, the sample periods are different for the Chinese companies listed and traded in different markets. The detailed information of these dual and triple listing

which includes listing date, industry and ADR ratio are shown in Appendix 2.1, 2.2, and 2.3.

To examine the market co-movement in terms of cross-listing, market indices including Shanghai SE Composite Index, Hang Seng Index, Shanghai A-Share Index, Shanghai B-Share Index, Shenzhen A-Share Index, Shenzhen B-Share Index, and S&P 500 Index are also obtained from Datastream. Datastream was also used to obtain the data for foreign exchange rates between Hong Kong to US dollars, US dollars and Chinese Yuan, and Hong Kong Dollars and Chinese Yuan.

5.3 Methodology

5.3.1 Preliminary Return Analysis

The company's realised returns can be calculated using the daily time series data of their respective total return index (RI). Note that the RI is an accurate measure of the company's over-all returns because it includes the market price appreciation, dividend returns and capitalisation changes related to the share, as opposed to the Price Index, which only takes into account market price appreciation, and the Accumulation Index, which only takes into account market value appreciation and dividend payouts. The continuously compounded rate of realised return of each company is computed by taking the natural logarithm of the ratio of ending period RI and beginning period RI of each company, as follows:

$$R_{it} = LN\left(\frac{RI_{it}}{RI_{it-1}}\right) \quad (5.1)$$

Where

R_{it} is daily return for the stock *i* on day t.

RI_{it} is total return index of stock *i* on day *t*.

Following Ding's (1999) study, the paired-sample T-test is used to compare the mean returns for the stocks dual-listed or triple-listed in the two or three different markets: New York, Hong Kong and Mainland China A-share markets. The pairs include China A-share to China B-share, China A-share to H-share, China A-share to Hong Kong H-share, and New York N-share.

For dual-listed Chinese A- and B-shares, we test the following hypothesis

H_0: there is no difference in the mean of the returns of A- and B-share ($H_0: \mu_A = \mu_B$) against

H_1: there is difference in the mean of the returns of A- and B-share;

For dual-listed Chinese A- and H-shares, we test the following hypothesis

H_0: there is no difference in the mean of the returns of A- and H-share ($H_0: \mu_A = \mu_{HK}$) against

H_1: there is difference in the mean of the returns of A- and H-share;

For triple-listed Chinese A-, H- and N-shares, we test the following hypothesis

H_0: there is no difference in the mean of the returns of A-, H- and N-share ($H_0: \mu_A = \mu_{HK} = \mu_{New\ York}$) against

H_1: there is difference in the mean of the returns of A-, H- and N-share.

To test the equality of variance between the return series, F test would be a useful one to compare the variances of two series.

For dual-listed Chinese A- and B-shares, we test the following hypothesis

H_0: there is no variance difference for A- and B-share ($H_0: {\sigma_A}^2 = {\sigma_B}^2$) against

H_1: there is variance difference for A- and B-share;

For dual-listed Chinese A- and H-shares, we test the following hypothesis

H_0: there is no variance difference for A- and H-share ($H_0: {\sigma_A}^2 = {\sigma_{HK}}^2$) against

H_1: there is variance difference for A- and H-share;

For triple-listed Chinese A-, H- and N-shares, we test the following hypothesis

H_0: there is no variance difference for A-, H- and N-share ($H_0: {\sigma_A}^2 = {\sigma_{HK}}^2 = {\sigma_{New\ York}}^2$) against

H_1: there is variance difference for A-, H- and N-share.

In the above statement, a paired T-test and F-test were used to compare means and variance for dual-listed total return series of Chinese shares. However, for Chinese shares triple-listed in the China A, Hong Kong and New York markets, there are three return series for one Chinese share. When we have more than two groups, it is

inappropriate to simply compare each pair by using a t-test because of the problem of multiple testing (Godfrey, 1985). Therefore, it is better to use *post hoc* Tukey's test (Tukey 1991) to examine the mean and variance difference for those triple-listed Chinese shares.

Within the *post hoc* Tukey's test, ANOVA is used because it possesses an advantage over a two-sample t-test. Doing multiple two-sample t-tests would result in an increased chance of committing a type I error. Welch's t test is adopted by assuming that the two samples might have possible unequal variances (Welch, 1947). Both Levene and Brown-Forsythe tests for homogeneity of variances tests are used in the same circumstance suggest that the null hypothesis of mean difference could not be rejected either. Under Levene's test (1960), an analysis of variance is performed on the absolute deviations of values from the respective group means. If the Levene test is statistically significant, then the hypothesis of homogeneous variances should be rejected. Later a more robust test that is very similar to the Levene test has been proposed by Brown and Forsythe (1974). This Brown and Forsyth test statistics is the F statistic resulting from an ordinary one-way analysis of variance on the absolute deviations from the median. The homogeneity of variance test is important since this is an assumption of ANOVA, but if this assumption turns out to be broken, the Brown-Forsythe and Welch options will display alternative versions of the F statistic. Therefore, the *post hoc* Tukey's test in this study covers all of these variance tests.

5.3.2 Market Co-movement

The examination of the co-market movement of Chinese cross-listings is discussed in this section and this study focus on the Chinese shares that are traded on both the China A- and B-share markets, and the Hong Kong market, and New York market. Hypothesis 4 is tested using the following regression equations for dual-listed shares, and a modified model of Froot and Dabora (1999) is employed.

$$R_{China\ A-China\ B,it} = \alpha + \beta_{i1} SZA_t + \beta_{i2} SZB_t + \beta_{i3} RMB/HK\$_t + \varepsilon_{it} \quad (5.2)$$

$$R_{China\ A-China\ B,it} = \alpha + \gamma_{i1} SHA_t + \gamma_{i2} SHB_t + \gamma_{i3} RMB/US\$_t + \varepsilon_{it} \quad (5.3)$$

$$R_{China\ A-H,it} = \alpha + \theta_{i1} SHA_t + \theta_{i2} Hang\ Seng_t + \theta_{i3} RMB/HK\$_t + \varepsilon_{it} \quad (5.4)$$

For the triple-listed Chinese shares that traded in the China A-share, Hong Kong, and New York markets, the model is modified by taking account of the non-synchronous trading time issue. If we measure the Chinese A-share and Hong Kong (H-share) returns on day *t*, and the US returns are measured on day *t-1*, the equation is shown as below:

$$R_{China\ A-H,it} = \alpha + \delta_{i1} S\&P_{t-1} + \delta_{i2} Hang\ Seng_t + \delta_{i3} SHA_t + \delta_{i4} HK\$/US\$_t + \delta_{i5} RMB/US\$_{t-1} + \delta_{i6} RMB/HK\$_t + \varepsilon_{it} \quad (5.5)$$

$$R_{China\ A-N,it} = \alpha + \vartheta_{i1} S\&P_{t-1} + \vartheta_{i2} Hang\ Seng_t + \vartheta_{i3} SHA_t + \vartheta_{i4} HK\$/US\$_t + \vartheta_{i5} RMB/US\$_{t-1} + \vartheta_{i6} RMB/HK\$_t + \varepsilon_{it} \quad (5.6)$$

$$R_{H-N,it} = \alpha + \tau_{i1} S\&P_{t-1} + \tau_{i2} Hang\ Seng_t + \tau_{i3} SHA_t + \tau_{i4} HK\$/US\$_t + \tau_{i5} RMB/US\$_{t-1} + \tau_{i6} RMB/HK\$_t + \varepsilon_{it} \quad (5.7)$$

Where

$R_{China\ A-China\ B,it}$ is the log returns of China A and China B dual-listed shares of firm *i* at time *t*.

$R_{China\ A-H,it}$ is the log returns of China A and Hong Kong dual-listed shares of firm *i* at time *t*.

$R_{China\ A-N,it}$ is the log returns of China A and New York dual-listed shares of firm *i* at time *t*.

$R_{H-N,it}$ is the log returns of Hong Kong and New York dual-listed shares of firm *i* at time *t*.

SHA_t is the log returns of China Shanghai A market index at time *t*.

SHB_t is the log returns of China Shanghai B market index at time *t*.

SZA_t is the log returns of China Shenzhen A market index at time *t*.

SZB_t is the log returns China Shenzhen B market index at time *t*.

$Hang\ Seng_t$ is the log index returns of Hong Kong market at time *t*.

$S\&P_{t-1}$ is the log index returns of New York market at time *t-1*.

$RMB_t/U\$_t$ is the log return of RMB/US$ exchange rate at time *t*.

$RMB_t/HK\$_t$ is the log return of RMB/HK$ exchange rate at time *t*.

$HK\$_t/US\$_t$ is the log return of HK$/US$ exchange rate at time *t*.

And the log return differentials for dual-listed shares (dual-listed Chinese A- and B-share is used as an example) are calculated as:

$$R_{China\ A-China\ B,it} = LN\left(\frac{R_{China\ A,it}}{R_{China\ A,it-1}}\right) - LN\left(\frac{R_{China\ B,it}}{R_{China\ B,it-1}}\right) \quad (5.8)$$

Where

$R_{China\ A-China\ B,it}$ is daily return difference of firm *i* between dual-listed A and B shares at *t*.

$R_{China\ A,it}$ is firm *i*'s RI dual-listed on A-share market on day *t*.

$R_{China\ A,it-1}$ is firm *i*'s RI dual-listed on A-share market on day *t-1*.

$R_{China\ B,it}$ is firm *i*'s RI dual-listed on B-share market on day *t*.

$R_{China\ B,it-1}$ is firm *i*'s RI dual-listed on B-share market on day *t-1*.

Standard tests and residual diagnostics revealed no major concerns with the above econometric models. It should be noted that most of the residuals of the above regression models exhibited ARCH effects and as a result a GARCH (1,1) was used to estimate them.

The null Hypothesis 4 in this context is that the international financial markets are integrated; that is, changes in the price differential are uncorrelated with the performance of the two markets in which the dual-listed securities are traded, but might be correlated with exchange rate movements since the dependent variable is the difference between price changes of securities traded in different currencies. The alternative hypothesis is that the markets are segmented and the returns of each dual-listed share are subject to the investors' sentiment so that the co-movement with the market depends on where the shares are traded. This hypothesis has been supported by the findings mostly from country funds studies (Bodurtha et al. 1995; Hardouvelis, La Porta & Wizman 1995). It is also expected that the coefficient to the local market will be positive and the foreign market would be negative. For example, a shock to the overall Chinese local market is expected to be associated with an increase (decrease) in the local currency price of the Chinese A-share relative to the local currency price of the Hong Kong H-share. The implication of this case is that the price differential is being driven to an extent by market-specific liquidity shocks or relative market sentiment.

5.3.3 Dual and Triple-listing and Cointegration

Prior studies have suggested that the two markets in which a cross-listed security trades should be integrated according to the law of one price (Lok & Kalev 2006). Although the empirical evidence did not support that markets are completely integrated, the findings of many prior studies show that markets are at least to some extent integrated (Kryzanowski & Zhang 2002; Lowengrub & Melvin 2002; Werner & Kleidon 1996). However, market integration does not mean that market prices are cointegrated, as Lence and Falk (2005) suggested that the concepts of integrated markets, cointegrated prices, and market efficiency are independent of one another and any zero, one, two or three of these characteristics can emerge in equilibrium, depending upon taste, endowment, and technology parameters. Lence and Falk (2005) used a standard dynamic general equilibrium asset-pricing model to study the relationship among the concepts of efficient markets, integrated markets, and cointegrated prices. In particular, the results of tests of cointegration among asset prices have no implication without additional restrictions on the economy or economies.

The concept of cointegration is viewed as a long-term equilibrium relationship that can be defined between non-stationary variables (Belkacem et al. 2005). According to Engle and Granger (1987), the non-stationary character of time series could be linked by a stationary linear association, which are described as being cointegrated, and the long-run equilibrium relationship between the two price series is termed the cointegrating equation. [1] Cointegration provides a relevant and useful econometric model for analysing financial market data when there are either several markets or several assets (Low et al. 1999). The cointegration statistic technique is commonly employed to test the long-run equilibrium relationship between variables (Aggarwal et al. 2005; Su et al. 2007; Shen et al. 2007), and is therefore used to test Hypothesis 5, examining the Chinese dual- and triple-listed securities that are listed and traded in China A- and B-share market, China A-share and Hong Kong market, China A-share, Hong Kong, and New York markets. If the dual- or triple-listed securities are cointegrated, then a linear relationship between the natural logarithms of the prices is suggested. The test of cointegration of two variable series (let us say dual-listed Hong Kong and China A-share) is shown as below:

[1] This cointegrating relationship can also be existed between more than two price series.

$$LN\left(RI_{i_t}^{HK}\right) = \alpha_0 + \alpha_1 LN\left(RI_{i_t}^{China\ A}\right) + \varepsilon_{it} \quad (5.9)$$

Where,

$RI_{i_t}^{HK}$ is the Chinese firm *i*'s RI series at Hong Kong market at time *t*; $RI_{i_t}^{China\ A}$ is the Chinese firm *i*'s RI series at China A-share market at time t; and series *HK* and *China A* are the identical shares for Chinese firm *i* that dual-listed in two different markets.

If the two RI series are cointegrated, the error term is expected to be stationary, and a long-run equilibrium relationship between the two series should exist. If natural logarithms of the RI series are both non-stationary and their first differences are stationary, they are integrated of the order one *I*(1). When each RI is *I*(1) and there is a linear combination of RI that are stationary, the RI series are regarded as to be cointegrated and hence a form of long-run stock market integration can be revealed. It is of interest to see whether RI of identical assets traded in different markets have the property of being statistically close in the sense of being cointegrated as it should be according to the theories.

5.3.3.1 Unit Root Test

The first step in testing for cointegration involves determining the order of integration of each RI series. In this study, Augmented Dickey-Fuller (ADF) test is employed for testing the hypothesis

H_o: RI series contains a unit root against
H_1: RI series is stationary.

We test the unit root effects with three different regression models, which are without drift and time trend (model 1), with drift (model 2) and with drift and time trend (model 3).

If the null hypothesis of a unit root cannot be rejected and the series are found to be *I*(1), a multivariate cointegration test would be applied. Intuitively, the returns of dual-listings should be highly correlated with each other since they represent identical assets. If any of these dual-listing has unit roots, then all the usual regression results might be

misleading and incorrect, which is a spurious regression problem. To overcome this problem, cointegration analysis is greatly employed in this study. (Geweke et al. 2006).

The null hypothesis of a unit root is rejected if the test statistic is smaller (more negative) than the ADF critical value. The decision rule is shown below:

If t* > ADF critical value, ⇒ Accept H_0. That is, unit root exists, series is non-stationary.

If t* < ADF critical value, ⇒ Reject H_0. That is, unit root does not exist, series is stationary.

5.3.3.2 Cointegration Analysis

Under the no-arbitrage conditions, there should be an equilibrium relationship among the series concerned. If there were no cointegration, there would be no long-run relationship binding the series together. In the context of dual-listings, since the dual-listings are representative of the identical assets in different markets, in time it is expected to be cointegrated, and will be affected in very similar ways by given information. Like purchasing power parity, the price difference between dual-listings should be cointegrated, otherwise, it would be profitable to buy the same assets from the lower price market and sell them in a higher price market assuming zero transactions costs (Bacchiocchi & Fanelli 2005).

ADF unit root test for non-stationary is employed first. Unit root test is run for each of the RI series for 132 Chinese firms that have dual or triple listings. Following the standard procedures as suggested in the literature on unit root tests and cointegration analysis (Corbae & Ouliaris 1986; Baillie & Bolerslev 1989), all the data are transformed into natural logarithms before tests are performed. If the log return series is found to be non-stationary and integrated of the same order from the ADF test, the Engle-Granger cointegration test is performed to examine the long-run equilibrium relationship (Engle & Granger 1987). Given that the logs of the RI series to be $I(1)$, it is appropriate to test for cointegration by forming a potentially cointegrating regression and testing its residuals for non-stationary. If the residuals of two RI series are cointegrated, for example, for the identical assets of the Hong Kong stock RI series and the US stock RI series; this means that these two RI series have a long-term relationship. To test for cointegration, the residuals of a regression of the log Hong Kong stock RI

series on the logged New York stock RI series are examined. To obtain the residual, the following cointegrating regressions are employed first:

$$X_{HK,it} = \beta_0 + \beta_1 Y_{New\ York,it} + \mu_{it} \quad (5.10)$$

Where

$X_{HK,it}$ is the natural logarithm of stock *i*'s RI series in Hong Kong at time *t*.

$Y_{New\ York,it}$ is the natural logarithm of stock *i*'s RI series in New York at time *t*.

μ_{it} is the residual and should be I(0) if the variables of $X_{HK,it}$ and $Y_{New\ York,it}$ are cointegrated. Thus it is necessary to test the residuals of (4.10) to see whether they are non-stationary or stationary. The ADF test can be used on $\Delta\hat{\mu}_{it}$, using a regression of the form

$$\Delta\hat{\mu}_{it} = \alpha_1 \hat{\mu}_{it-1} + \varepsilon_{it} \quad (5.11)$$

with ε_{it} an iid error term.

If the stock RI series are found to be cointegrated then some linear combination of them will be stationary although they are non-stationary individually, which means there is a long-run equilibrium relationship among them.

There are two popular approaches to examine cointegration namely Engle-Granger approach and Johansen Cointegration for estimating number of cointegrated vectors. Although the Engle-Granger approach is relatively easy to use, one of its major drawbacks is that it can estimate only up to one cointegrating relationship between the variables. In our dual-listing examples, there are only two variables in an equation, $X_{HK,it}$ and $Y_{New\ York,it}$, there can be at most only one linear combination of $X_{HK,it}$ and $Y_{New\ York,it}$ that is stationary – i.e. at most one cointegrating relationship. However, in the triple-listing case of this study, there are three variables (stock RI series in market Hong Kong, New York, and Mainland China) in the system and therefore there could be potentially be up to two linearly independent cointegrating relationships. Thus, it is appropriate to examine the issue of cointegration within the Johansen Vector Auto Regression (VAR) framework (Brooks 2002) to see what the number of cointegrating vectors is for the triple-listed Chinese securities.

A VAR model describes a set of *g* variables over the same sample period (t=1,…,T) as a linear function of only their past evolution. The variables are collected in a g × 1 vector y_t, which has as the i[th] element $y_{1,it}$ the time t observation of variable y_i. In our triple-listing case (China A, Hong Kong and New York), we have a set of 3 variables, i.e. three RI series for one Chinese firm, under consideration that are *I*(1) and which are suspected to be cointegrated. Therefore, a VAR with *k* lags containing these three variables could be set up:

$$y_{1,it} = \beta_{1,0} + \beta_{1,1}y_{1,it-1} + \beta_{1,2}y_{1,it-2} + \cdots + \beta_{1,k}y_{1,it-k} + \mu_{1,it} \quad (5.12)$$

$$y_{2,it} = \beta_{2,0} + \beta_{2,1}y_{2,it-1} + \beta_{2,2}y_{2,it-2} + \cdots + \beta_{2,k}y_{2,it-k} + \mu_{2,it} \quad (5.13)$$

$$y_{3,it} = \beta_{3,0} + \beta_{3,1}y_{3,it-1} + \beta_{3,2}y_{3,it-2} + \cdots + \beta_{3,k}y_{3,it-k} + \mu_{3,it} \quad (5.14)$$

Or written as a compactly one:

$$y_t = \beta_0 + \beta_1 y_{i,t-1} + \beta_2 y_{i,t-2} + \cdots + \beta_k y_{i,t-k} + \mu_{it} \quad (5.15)$$

Where $y_t = \begin{bmatrix} y_{China\ A,it} \\ y_{Hong\ Kong,it} \\ y_{New\ York,it} \end{bmatrix}$

There are two test statistics for cointegration under the Johansen's approach. If we want to test *r* + 1 cointegrating vectors against *r* cointegrating vectors we should use λ_{max} test. Or we can use trace test to test for zero cointegrating vectors. Since there are three variables in the system, i.e. g = 3, there can be at most 2 linearly independent cointegrating vectors, i.e. r ≤ 2. Therefore, the statistic is taken the form of:

$$\lambda_{trace}(r) = -T\sum_{i=r+1}^{g} ln\left(1 - \widehat{\lambda_i}\right) \quad (5.16)$$

Or

$$\lambda_{max}(r, r+1) = -Tln\left(1 - \widehat{\lambda_i}\right) \quad (5.17)$$

Where

r is the number of cointegrating vectors under the null hypothesis, and $\widehat{\lambda_i}$ is the estimated value for the *i*th ordered Eigen value from the Π matrix.

Johansen and Juselius (1990) provide critical values for these two statistics. If the test statistic is greater than the critical value from Johansen's tables, reject the null

hypothesis that there are *r* cointegrating vectors in favour of the alternative that there are *r+1* (for λ_{trace}) or more than *r* (for λ_{max}).

5.3.4 Granger Causality Test

Granger (1969) causality framework is applied to test Hypothesis 6 in this study to examine the direction of information flows, and whether any market, China A-share market, Hong Kong or New York can be viewed as dominant in terms of information discovery. In general, if we denote the two time series under study as RI series of firm *i* dual-listed in China A and HK market, the model to be estimated takes the form as:

$$RI_{i_t}^{China\ A} = \alpha^{China\ A} + \sum_{j=1}^{p} \beta_j^{China\ A} RI_{i_{t-j}}^{China\ A} + \sum_{j=1}^{p} \gamma_j^{China\ A} RI_{i_{t-j}}^{HK} + \varepsilon_t^{China\ A} \tag{5.18}$$

$$RI_{i_t}^{HK} = \alpha^{HK} + \sum_{j=1}^{p} \beta_j^{HK} RI_{i_{t-j}}^{China\ A} + \sum_{j=1}^{p} \gamma_j^{HK} RI_{i_{t-j}}^{HK} + \varepsilon_t^{HK} \tag{5.19}$$

Where *p* is autoregressive lag length, $j = 1, 2, \ldots, p$.

$RI_{i_t}^{China\ A}$ is firm *i*'s RI dual-listed on A-share market on day *t.*

$RI_{i_t}^{HK}$ is firm *i*'s RI dual-listed on Hong Kong market on day *t.*

$\sum_{j=1}^{p} \beta_j^{China\ A} RI_{i_{t-j}}^{China\ A}$ is the summation of all the lagged values of firm *i*'s RI dual-listed on A-share market.

$\sum_{j=1}^{p} \gamma_j^{China\ A} RI_{i_{t-j}}^{HK}$ is the summation of all the lagged values of firm *i*'s RI dual-listed on Hong Kong market.

$\varepsilon_t^{China\ A}$ and ε_t^{HK} are independently distributed.

and test the hypothesis that $RI_i^{China\ A}$ (the China A-share's RI for firm *i*) Granger-causes RI_i^{HK} (the Hong Kong share's RI for firm *i*). According Granger (1969), $RI_i^{China\ A}$ Granger-causes RI_i^{HK} if the lagged values of $RI_i^{China\ A}$ in the regression of RI_i^{HK} on lagged RI_i^{HK} and $RI_i^{China\ A}$ are statistically significant. Simply, $RI_i^{China\ A}$ is said to cause another times series RI_i^{HK}, if present RI_i^{HK} can be predicted better using the value of $RI_i^{China\ A}$.

Model 5.18 and Model 5.19 are used to examine the Granger causality between the dual-listed Chinese shares that listed in different markets, namely, dual-listed China A and China B-shares, dual-listed China A-shares and Hong Kong shares, dual-listed Hong Kong shares and New York shares, and dual-listed China A-shares and New York shares. Overall, the possible outcomes should be: two cases of unidirectional causality ($I_i^{China\ A}$ causing RI_i^{HK} or RI_i^{HK} causing $RI_i^{China\ A}$), no causality, and causality running both ways.

The null and alternative hypotheses of the Granger causality test are:$H_0 : RI_i^{China\ A} \nRightarrow RI_i^{HK}$ ($RI_i^{China\ A}$ does not granger-cause RI_i^{HK}), and $H_1 : RI_i^{China\ A} \Rightarrow RI_i^{HK}$ ($RI_i^{China\ A}$ does granger-cause RI_i^{HK}).

The RI series properties of each stock should have been checked by conducting the ADF test of stationary. When all the stock RI series are non-stationary in levels and their first differences turn out to be stationary, the causality test will be carried out in a framework of unrestricted reduced form vector autoregression in first difference variables. However, it is also noting that Granger causality does not mean that movements in one variable physically cause movements in another. In this case, a movement in the Hong Kong stock market for the cross-listings was not a direct result movement in the New York Stock market. Rather, this causality simply implies a chronological ordering of movements of the time series.

5.3.5 Error Correction Model

In addition to learning about a potential long-run relationship between the Chinese dual-listings, error correction model is also implied to investigate the short-run dynamics in the relationship between the Chinese shares dual-listed and traded in two or three different markets, which is the test of Hypothesis 7. In view of the dual-listed Chinese securities, it is interesting to inquire whether the behaviour of the identical dual-listed securities can be modelled as a chase of long-run equilibrium plus error correction. Suppose the two dual-listed Chinese securities have long-run equilibrium relationship; we have the relationship in log form as:

$$RI_{i_t}^{China\ B} = c + RI_{i_t}^{China\ A} \tag{5.20}$$

Where $RI_{i_t}^{China\ B}$ and $RI_{i_t}^{China\ A}$ are the RI series of the identical Chinese securities that traded on China A and B-share markets. If we take the lagged values of both $RI_{i_t}^{China\ A}$ and $RI_{i_t}^{China\ B}$, a general dynamic relationship between $RI_{i_t}^{China\ B}$ and $RI_{i_t}^{China\ A}$ becomes:

$$RI_{i_t}^{China\ B} = \beta_0 + \beta_1 RI_{i_t}^{China\ A} + \beta_2 RI_{i_{t-1}}^{China\ A} + \alpha_1 RI_{i_{t-1}}^{China\ B} + \mu_{it} \quad (5.21)$$

Next, if we want to keep the dynamic relationship equation consistent with the long-run equilibrium relationship, we need to zero out the changes in $RI_{i_t}^{China\ A}$ and $RI_{i_t}^{China\ B}$, and set up $\mu_{it} = 0$ to eliminate any divergence from equilibrium. Thus, we obtain:

$$RI_{i_t}^{China\ B} = \beta_0 + \beta_1 RI_{i_t}^{China\ A} + \beta_2 RI_{i_t}^{China\ A} + \alpha_1 RI_{i_t}^{China\ B} \quad (5.22)$$

Rearrange the equation, and we obtain:

$$RI_{i_t}^{China\ B} = \frac{\beta_0}{1-\alpha_1} + \frac{\beta_1+\beta_2}{1-\alpha_1} RI_{i_t}^{China\ A} \quad (5.23)$$

Corresponding this equation to the long-run equilibrium equation, we need to have:

$$\frac{\beta_0}{1-\alpha_1} = \mathrm{c}\ and\ \frac{\beta_1+\beta_2}{1-\alpha_1} = 1 \quad (5.24)$$

Then, we have:

$$\beta_1 + \beta_2 = 1 - \alpha_1 \quad (5.25)$$

Let denote that:

$$\beta_1 + \beta_2 = 1 - \alpha_1 = \gamma \quad (5.26)$$

We have:

$$\beta_2 = \gamma - \beta_1\ and\ \alpha_1 = 1 - \gamma \quad (5.27)$$

We plug β_2 and α_1 into the dynamic equation, then the dynamic equation becomes:

$$RI_{i_t}^{China\ B} = \beta_0 + \beta_1 RI_{i_t}^{China\ A} + (\gamma - \beta_1) RI_{i_{t-1}}^{China\ A} + (1-\gamma) RI_{i_{t-1}}^{China\ B} + \mu_{it} \quad (5.28)$$

$$RI_{i_t}^{China\ B} = \beta_0 + \beta_1 RI_{i_t}^{China\ A} - \beta_1 RI_{i_{t-1}}^{China\ A} + \gamma RI_{i_{t-1}}^{China\ A} - \gamma RI_{i_{t-1}}^{China\ B} + \mu_{it} \quad (5.29)$$

$$RI_{i_t}^{China\ B} - RI_{i_{t-1}}^{China\ B} = \beta_0 + \beta_1\left(RI_{i_t}^{China\ A} - RI_{i_{t-1}}^{China\ A}\right) + \gamma(RI_{i_{t-1}}^{China\ A} - RI_{i_{t-1}}^{China\ B}) + \mu_{it} \quad (5.30)$$

At the end, we have the error correction model as:

$$\Delta RI_{i_t}^{China\ B} = \beta_0 + \beta_1 \Delta RI_{i_t}^{China\ A} + \gamma(RI_{i_{t-1}}^{China\ A} - RI_{i_{t-1}}^{China\ B}) + \mu_{it} \quad (5.31)$$

Where

$\Delta RI_{i_t}^{China\ A} = RI_{i_t}^{China\ A} - RI_{i_{t-1}}^{China\ A}$, $\Delta RI_{i_t}^{China\ B} = RI_{i_t}^{China\ B} - RI_{i_{t-1}}^{China\ B}$, β_1 is the short run elasticity, and γ is the short run adjustment response coefficient.

The above model (5.31) based on Cottrell's (2004) error correction model illustrates that the price changes in one of the dual-listed Chinese securities is related to change in another one, as well as the price gap between these two identical securities in the previous period. The validity of the assumed model can be tested when all the variables are *I*(1) and cointegrated, which should lead to a valid OLS estimation.

Lieberman et al.'s (1999) modified model is adopted in this study by including the changes of the market index. However, the foreign market index is not incorporated in the model due to the insignificant effects in Lieberman's study. Based on the market co-movement study in section 5.4.2, both of the market indices are used in this analysis. Therefore the final estimated models for this examination are:

For the dual-listings traded both in China A (both Shanghai and Shenzhen) and China B (both Shanghai and Shenzhen) markets:

$$\Delta RI_{i_t}^{China\ B} = \beta_0 + \beta_1 \Delta RI_{i_t}^{China\ A} + \gamma_2\left(RI_{i_{t-1}}^{China\ A} - RI_{i_{t-1}}^{China\ B}\right) + \gamma_3 \Delta SHA_t + \gamma_4 \Delta SHB_t + \mu_{it} \quad (5.32)$$

$$\Delta RI_{i_t}^{China\ A} = \beta_0 + \beta_1 \Delta RI_{i_t}^{China\ B} + \gamma_2\left(RI_{i_{t-1}}^{China\ B} - RI_{i_{t-1}}^{China\ A}\right) + \gamma_3 \Delta SZA_t + \gamma_4 \Delta SZB_t + \mu_{it} \quad (5.33)$$

For the dual-listings traded both in China A-share and Hong Kong market:

$$\Delta RI_{i_t}^{HK} = \beta_0 + \beta_1 \Delta RI_{i_t}^{China\ A} + \gamma_2\left(RI_{i_{t-1}}^{China\ A} - RI_{i_{t-1}}^{HK}\right) + \gamma_3 \Delta Shanghai\ Composite_t + \gamma_4 \Delta Hang\ Seng_t + \mu_{it} \quad (5.34)$$

$$\Delta RI_{i_t}^{China\ A} =$$

$$\beta_0 + \beta_1 \Delta RI_{i_t}^{HK} + \gamma_2 \left(RI_{i_{t-1}}^{HK} - RI_{i_{t-1}}^{China\ A}\right) + \gamma_3 \Delta Shanghai\ Composite_t +$$

$$\gamma_4 \Delta Hang\ Seng_t + \mu_{it} \quad (5.35)$$

Since there is no overlap trading time for Chinese market and New York market, the time difference between China (and Hong Kong) and New York need to be adjusted for the time periods in which the terms in the error correction model. Therefore, the model for the dual-listings traded both in Hong Kong and New York are:

$$\Delta RI_{i_t}^{HK} = \beta_0 + \beta_1 \Delta RI_{i_t}^{NY} + \gamma_2 \left(RI_{i_{t-1}}^{NY} - RI_{i_{t-2}}^{HK}\right) + \gamma_3 \Delta S\&P500_t + \gamma_4 \Delta Hangseng_t +$$

$$\mu_{it} \quad (5.36)$$

$$\Delta RI_{i_t}^{NY} = \beta_0 + \beta_1 \Delta RI_{i_t}^{HK} + \gamma_2 \left(RI_{i_{t-2}}^{HK} - RI_{i_{t-1}}^{NY}\right) + \gamma_3 \Delta S\&P500_t + \gamma_4 \Delta Hangseng_t +$$

$$\mu_{it} \quad (5.37)$$

Where

RI_t^A represents RI of Chinese firm *i* listed in China A-share market.

RI_t^B represents RI of Chinese firm *i* listed in China B-share market.

RI_t^{HK} represents RI of Chinese firm *i* listed in Hong Kong market.

RI_t^{NY} represents RI of Chinese firm *i* listed in New York market.

SHA_t represents China Shanghai A market index at time *t*.

SHB_t represents China Shanghai B market index at time *t*.

SZA_t represents China Shenzhen A market index at time *t*.

SZB_t represents China Shenzhen B market index at time *t*.

Shanghai Composite represents China market index.

S&P500 represents US market index.

Hang Seng represents Hong Kong market Index.

When dealing with error correction model methodology, daily return index and market index data in logarithmic form is used during the period examined.

5.4 Empirical Results

5.4.1 Preliminary Return Analysis Results

5.4.1.1 Descriptive Statistics

In general, several measures are commonly used to describe a particular return distribution: mean, maximum, minimum, standard deviation, excess kurtosis, skewness, and Jarque-Bera. Appendix 3.1 to Appendix 3.3 present these measures based on the continuously compounded daily returns of each Chinese company that is cross-listed in different markets. Total return index for 132 dual and triple Chinese listings are collected from 1st January 1993 to 31st December, 2008. The cross sectional summary descriptive statistics for the dual-listings in different market is reported in Table 5.1.

The results in Panel A of Table 5.1 clearly show that a high excess kurtosis of the returns distribution prevails in our data set and it forces the rejection of normality of the distribution for all the Chinese firms in all of the markets under the traditional Jarque-Bera normality test. The excess kurtosis also suggests that many observations lie in the tail of the distribution The results show that the standard deviation for return series is around three per cent, and most of the standard deviations are in the range of two per cent to 4 per cent over the period of 1993 to 2008, suggesting that there is a mild considerable variation in the daily returns over the period. The return series exhibit a positive skewness, indicating there have many positive numbers. Chinese firms dual-listed in Hong Kong and China A-market, and Chinese firms triple-listed in China A-market, Hong Kong and New York market have averagely negative daily returns, revealing that those Chinese firms have underperformed when compared to other markets. The daily maximum return is recorded as 132.93 per cent in China A market, and the daily minimum return also happens in China A market which was -69.31 per cent. The large maximum and minimum returns indicate that the prices of the Chinese shares could be extremely volatile within a day period.

The summary descriptive statistics for 8 examined market indices are reported in Panel B of Table 5.1 during the period of 1993 to 2008. The daily mean returns for the examined 8 market indices are very similar to each other, around 0.02 percent. But the daily return of Hong Kong market measured by Hang Seng Index was 0.04 per cent. Unlike the individual share, the maximum daily market return was 30.85 per cent, and the minimum daily market return was -19.63 per cent. Again, the distribution exhibits

the characteristics of a non-normal distribution with larger excess kurtosis. A positive skewness for seven markets is observed except S&P 500 index.

In summary, all of the return series for the analysed Chinese firms and market indices over the studied period do not exhibit characteristics of a normal distribution. Varying levels of excess kurtosis and skewness are observable in the sample Chinese firms. This is consistent with empirical studies that show that a typical return distribution, particularly those that are sampled over small intervals, tend to be asymmetric (positively or negatively skewed) and with observations lying at the tails of the distribution (Chan & Lakonishok 1992). Further, the Chinese firms listed and traded in local Chinese markets exhibit a similar statistic descriptive output. For the Chinese firms listed in the Hong Kong and New York markets, a similar characteristic of the statistical description is observed.

Table 5.1: Summary Descriptive Statistics for Chinese Dual-listings in Different Markets and Market Indices

This table reports the summary statistics for daily returns on dual and triple traded Chinese shares in different markets, and the return statistics for market indices. The calculated statistics are the mean, the standard deviation, skewness coefficient, excess kurtosis, maximum, minimum and Jarque-Bera during the period of 1993 to 2008.

Panel A: Chinese firms dual and triple-listings							
	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
Shares dual-listed on A and B markets							
A	0.0001	1.3293	-0.6931	0.0318	0.6830	26.5223	530040.1863
B	0.0001	0.8079	-0.7101	0.0313	0.3543	14.1430	56895.0872
Shares dual-listed on A and B markets							
A	-0.0009	0.5601	-0.5402	0.0336	0.0653	8.6593	8285.4086
H	0.0002	0.7360	-0.4643	0.0360	0.3931	13.2976	48894.9347
Shares triple-listed on A and B markets							
A	-0.0008	0.3246	-0.2365	0.0294	0.1005	7.3782	5959.1035
H	0.0005	0.5600	-0.3131	0.0311	0.3162	8.9769	5814.5571
N	0.0005	0.5049	-0.3279	0.0322	0.3460	9.0513	6164.8775
Panel B: Market Indices							
	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
Shanghai Composite	0.0002	0.0886	-0.1791	0.0227	1.1294	22.4901	66936.2100
Shanghai A-share Index	0.0002	0.3085	-0.1843	0.0232	1.2339	24.3089	80010.4500
Shanghai B-share Index	0.0001	0.1218	-0.1309	0.0225	0.2222	7.7307	3925.5400
Shenzhen A-share Index	0.0002	0.2958	-0.1963	0.0227	0.7576	20.0909	51187.8500
Shenzhen B-share Index	0.0002	0.1380	-0.1670	0.0218	0.2077	9.9452	8417.0500
Hang Seng Index	0.0004	0.1725	-0.1474	0.0173	0.0714	13.1848	18038.1000
S&P 500 Index	0.0002	0.1096	-0.0946	0.0116	-0.2405	13.5742	19481.8500

5.4.1.2 Testing Equality of Mean Returns and Variances

Table 5.2 presents the test statistics of equal means and variances for the dual-listed Chinese firms' returns data during the period of 1993 to 2008.

Panel A of Table 5.2 presents the summary statistics of the datasets employed to compare the daily stock returns of the dual and triple-listed Chinese stocks listed on the China A, China B, Hong Kong and New York markets. In all of the panel B section in the table, the low t-statistic values infer that we cannot reject the null hypothesis that the means of the daily returns on either pairs are equal at the five per cent level of significance, indicating that all of these dual or triple-listings have the same return for the period we studied. When examining the Chinese dual-listed shares listed in both China A and China B market, F-statistic of 1.2221 leads to the rejection of the null hypothesis at the five per cent level that the return variance of the China A and China B are equal. However, dual-listed Chinese shares listed in China A and Hong Kong, Hong Kong and New York markets accept the null hypothesis, which indicates that the return variance is similar in these markets for the dual-listed Chinese shares with those F statistics are significant at the 10 per cent level.

A more detailed analysis for each return series are presented in Appendix 4.1 to Appendix 4.3. The results show that most of the pairs in these markets (China A and B, Hong Kong and New York) have similar variance. Yet, several sample pairs have the different variance in these markets. For the dual-listed shares traded in China A- and B-shares markets, they exhibit higher correlation relationship, so do the pairs traded in the Hong Kong and New York Markets. The shares traded in both the Hong Kong and China A-share markets have lower correlation relationship (r = 0.34). Shares traded in both the China A-share and New York markets have the lowest correlation (r = 0.20) (please refer to Appendix 4.1 to 4.3). The low correlation relationship between Mainland China and Hong Kong, Mainland China and US among these dual-listed securities traded in three different markets suggest that some significant diversification benefits may exist.

Table 5.2: Comparison of Daily Stock Returns for Chinese Stocks Dual and Triple-listed in China A, B-share Market, HK and New York Market

Daily Stock Returns of Shares Traded on China A, and China B

Panel A: Sample Statistics		
	China A	**China B**
Mean Returns	0.0001	0.0001
Variance of Returns	0.0010	0.0010
Standard Deviation of Returns	0.0318	0.0313
Panel B: comparison of Mean Returns		
	t-statistic	p-value
Matched-pairs t-test	0.0502	0.8437
Panel C: Comparison of Return Variance		
	F-statistic	p-value
F-test	1.2221	0.0381

Daily Stock Returns of Shares Traded on China A, and Hong Kong

Panel A: Sample Statistics		
	China A	**Hong Kong**
Mean Returns	-0.0009	0.0002
Variance of Returns	0.0011	0.0013
Standard Deviation of Returns	0.0336	0.0360
Panel B: comparison of Mean Returns		
	t-statistic	p-value
Matched-pairs t-test	-0.2620	0.7100
Panel C: Comparison of Return Variance		
	F-statistic	p-value
F-test	0.6620	0.0740

Daily Stock Returns of Shares Traded on China A, Hong Kong, and New York

Panel A: Sample Statistics			
	China A	**Hong Kong**	**New York**
Mean Returns	-0.0008	0.0005	0.0005
Variance of Returns	0.0009	0.0010	0.0010
Standard Deviation of Returns	0.0294	0.0311	0.0322
Panel B: comparison of Mean Returns			
	t-statistic		p-value
Matched-pairs t-test	-0.2180		0.8030
Panel C: Comparison of Return Variance			
	F-statistic		p-value
F-test	0.7770		0.0810

In summary, by analysing daily return data for the Chinese dual-listed securities in China A- and B-share, Hong Kong and New York markets, it is found that the return series for dual- or triple-listed Chinese shares exhibit similar pattern although the observed share prices for the Chinese dual-listings are different, suggesting that the three markets (China, Hong Kong and New York) are closely linked. However, the variance of the return distribution for dual-listed China A and B-shares is significantly different from each pair combined at 5 per cent level, indicating that the risk in each market is different. Market risk effects of cross-listing on underlying securities have been extensively examined both theoretically and empirically in literature. Ideally, if the international capital markets were fully integrated, the dual-listed securities will be priced the same. Consequently, these securities will be priced with reference to both their domestic and foreign market risks (Eun and Janakiramanan, 1990). If the foreign and domestic markets are not perfectly correlated, which is likely to be the case for two segmented markets, a diversification effect should result from an international listing, causing a decrease in standard deviation of stock returns (Foerster and Karolyi, 1993). Since this study is not the study of risk factors, the risk differential of Chinese triple listings could be further explored in future studies.

5.4.1.3 Post hoc Tukey's Test

There are only 11 Chinese companies that have shares triple-listed in China A, Hong Kong and New York market, the Tukey's test results for these 11 triple-listed Chinese shares are presented in Table 5.3.

The homogeneity variance is measured by Levene's test is shown on the second column. Levene Statistics for these 11 Chinese companies are significant at five per cent for ten cases so the variances of the three return groups are significantly different. There is one exceptional case of the company of China Life Insurance, which presents a high p-value, indicating that the null hypothesis could not be rejected and there is no difference between the variance in the sample. However, the results from the ANOVA test indicate that the null hypothesis could not be rejected that there is no difference in the mean returns within different groups for ten cases (Petro China is exceptional). Lastly, the *post hoc* Tukey's test results tell which groups are responsible for the difference.

Table 5.3: Tukey's Test Results for Triple-Listed Chinese Shares

	Levene Statistic	ANOVA	Welch	Brown Forsythe	Tukey's Test		
Sinopec Shanghai	83.145*	0.014	0.016	0.014	China-Hong Kong	0.000	(0.988)
	(0.000)	(0.986)	(0.984)	(0.986)	China-New York	0.000	(0.989)
					New York-Hong Kong	0.000	(1.000)
Yanzhou Coal	76.423*	0.206	0.255	0.206	China-Hong Kong	-0.001	(0.845)
	(0.000)	(0.814)	(0.775)	(0.814)	China-New York	-0.001	(0.842)
					New York-Hong Kong	0.000	(1.000)
Aluminum	5.750*	0.034	0.039	0.034	China-Hong Kong	-0.001	(0.977)
	(0.000)	(0.966)	(0.962)	(0.966)	China-New York	-0.001	(0.968)
					New York-Hong Kong	0.000	(1.000)
Chinese Eastern	63.580*	0.003	0.003	0.003	China-Hong Kong	0.000	(0.998)
	(0.000)	(0.997)	(0.997)	(0.997)	China-New York	0.000	(0.998)
					New York-Hong Kong	0.000	(1.000)
China Life	2.190	0.222	0.225	0.225	China-Hong Kong	-0.001	(0.842)
	(0.112)	(0.801)	(0.799)	(0.801)	China-New York	-0.001	(0.824)
					New York-Hong Kong	0.000	(1.000)
China Petro	13.760*	0.225	0.245	0.225	China-Hong Kong	-0.001	(0.836)
	(0.000)	(0.799)	(0.783)	(0.799)	China-New York	-0.001	(0.825)
					New York-Hong Kong	0.000	(1.000)
China Southern	5.508*	0.024	0.026	0.024	China-Hong Kong	0.000	(0.978)
	(0.004)	(0.976)	(0.974)	(0.976)	China-New York	0.000	(0.983)
					New York-Hong Kong	0.000	(1.000)
China United Telcor	29.394*	0.009	0.01	0.009	China-Hong Kong	0.000	(0.994)
	(0.000)	(0.991)	(0.990)	(0.991)	China-New York	0.000	(0.991)
					New York-Hong Kong	0.000	(1.000)
Guangshen Railway	4.625*	0.001	0.001	0.001	China-Hong Kong	0.000	(1.000)
	(0.010)	(0.999)	(0.999)	(0.999)	China-New York	0.000	(1.000)
					New York-Hong Kong	0.000	(1.000)
Huaneng Power	4.763*	0.271	0.281	0.271	China-Hong Kong	-0.001	(0.807)
	(0.009)	(0.762)	(0.755)	(0.762)	China-New York	-0.001	(0.792)
					New York-Hong Kong	0.000	(1.000)
Petro China	6.077*	7.251*	6.047*	6.638*	China-Hong Kong	-0.006*	(0.001)
	(0.002)	(0.001)	(0.002)	(0.001)	China-New York	-0.006*	(0.001)
					New York-Hong Kong	0.000	(0.999)

*Note: p-values are in parenthesis, * denotes significant at 1 per cent level*

Generally speaking, the null hypothesis could not be rejected for most of the Chinese shares that triple-listed in China A, Hong Kong and New York markets. The results indicate that the return and variance for these triple-listed shares are similar to one another. However, China Petro (the company) provides an exceptional example with p value less than 0.01, which suggests that returns and variance for shares listed in China and Hong Kong, China and New York are significant different at one per cent level. The results from *post hoc* Tukey's test for the triple Chinese listings are very similar to the results from the paired T-test.

5.4.2 Market Co-movement

The regression results are presented in Table 5.4 (detailed individual results are present at Appendices 5.1 to 5.4) for Chinese dual-listed shares traded in the China A- and B-share markets, the China A-share and Hong Kong markets, and the China A-share, Hong Kong, and New York markets, respectively. When performing the regression analysis procedures, the correlation coefficient among independent variables are examined with the variance inflation factor (VIF). The lower values of all of the VIFs suggest there are fewer multicollenearity issues. The results strongly reject the Hypothesis 4. All the coefficients for the market returns are significantly different from zero at the one per cent level, suggesting that the relative price of the dual-listed shares is very substantially affected by the relative performance of their representative markets within the short-term horizon. For example, Aluminium is a Chinese Company dual-listed in the China A-share and Hong Kong markets. The coefficients for Shanghai A-share market is 1.21 (please refer to Appendix 5.4), implying that a 10 per cent increase in the China (Shanghai) benchmark index is associated with an increase in the relative price of the dual-listed Aluminium in China A and Hong Kong market of around 12.1 per cent. Further, the insignificant coefficients of the foreign exchange rate indicate that the expected exchange rate does not play an important role in determining the price differences, which is different from the study of Arquette et al. (2008). The insignificant coefficient for the exchange rate indicates that the exchange rate that changes in the short-term has no significant effects on the price differential. This result is in line with the expected effect of the current exchange rate policy adopted by the Chinese government.

In summary, the examination in this section reveals that share prices are affected by the location of trade not only for the twin shares (refer to Froot and Dabora's study) but also for the dual-listed shares, and dual-listed Chinese shares that should be nearly identical for everything moves more like the markets where they trade most intensively. These results provide evidence of co-movement between dual-listed price differentials, and aggregate market index is a pervasive feature of the dual-listed Chinese shares for one-day horizon; therefore, the market co-movement phenomenon is a short-term phenomenon. Location of trade therefore appears to be matter to pricing in the short run. The results are also consistent with the work by Froot and Dabora's (1999), Sosner and

Greenwood (2002) and Chan et al. (2003) that studied how the covariance of returns changes due to changes in the index composition or trading location.

Table 5.4: Market Co-movement Regression Results

This table reports the summary coefficients for the regression analysis. Occasionally, there might one or two exceptional cases that show the different coefficient signs in Hang Seng and New York market. Detailed individual analysis refers to Appendices 5.1, 5.2, 5.3 and 5.4).

	Shen Zhen A	Shen Zhen B	Shang Hai A	Shang Hai B	Hang Seng	S&P500	RMB/HK$	RMB/US$	HK/US$
A-B (38 pairs) (equation 4.2)	+	-					no effect		
A-B (39 pairs) (equation 4.3)			+	-				no effect	
A-H (42 pairs) (equation 4.4)			+		-		no effect		
A-H (11 pairs) (equation 4.5)			+		-	no effect	no effect	no effect	no effect
A-N (11 pairs) (equation 4.6)			+		-	-	no effect	no effect	no effect
H-N (14 pairs) (equation 4.7)			no effects		+	-	no effect	no effect	no effect

Note: + denotes positive and significant at 0.05 or 0.01 level.
- denotes negative and significant at 0.05 or 0.01 level.

5.4.3 Cointegration

5.4.3.1 Unit Root Results

ADF unit root tests of the null hypothesis of non-stationary are performed on all of the dual-listed pairs in return level and return-differenced forms. In general, analysis of the return level series indicates non-stationary for the pairs that are traded in these four markets. Appendices 6.1, 6.2 and 6.3 present the results of the ADF (Dickey & Fuller 1981) unit root tests. The number of lags is selected according to the Akaike Information Criterion. The computed ADF test-statistics exceed the critical values at one per cent, five per cent, and 10 per cent significant level respectively. Therefore, the null hypotheses of unit roots in dual-listed return series cannot be rejected in all of the markets with Models 1, 2, and 3, suggesting that the Chinese dual-listings' return series is a non-stationary series and there are unit roots in return series in all markets. Moreover, unit roots in the first difference of return series are rejected at one per cent, five per cent, and 10 per cent significant level, which suggests the changes in return series are stationary. Thus, the return series are $I(1)$, implying that the return series level of the ith market at time t is solely dependent on the return series at $t-1$, plus an error term. The results are also consistent with the overall weak form efficient through the lens of dual-listings and all series follow $I(1)$ processes. Since most of log return series

are found to be non-stationary and integrated of the first difference order from the ADF test, the Engle-Granger cointegration test is performed then. The results are presented in the following section.

5.4.3.2 Engle-Granger Cointegration Test Results

Table 5.5: Engle-Granger Cointegration Test Results for Chinese Firms Dual-Listed on China A-Share and B-Share Markets from 1993 to 2008

Pairs	ADF Test Statistics	Pairs	ADF Test Statistics
Anhui Guijing Distiller	-4.138 ***	Shanghai Baosight	-4.765 ***
Bengang Steel Plate	-3.843 **	Shanghai Chlor-Alkali	-2.722
BOE Technology	-6.088 ***	Shanghai Diesel	-4.834 ***
Changchai Company	-4.966 ***	Shanghai Dingli Technology	-4.289 ***
China Fanda	-4.558 ***	Shanghai Erfangji	-5.219 ***
China First Pencil	-4.436 ***	Shanghai Friendship	-4.505 ***
China Interational Marine Container	-4.002 ***	Shanghai Haixin Group	-2.961
China Merchants Propert Development	-3.436 **	Shanghai Highly Group	-5.500 ***
China Textile Machinery	-4.850 ***	Shanghai Jinjiang Hotel	-4.385 ***
China Vanke	-2.721	Shanghai Jinjiang International	-4.593 ***
Congqing Changan Automobile	-3.550 **	Shanghai Jinqiao	-4.401 ***
CSG Holding	-3.295 *	Shanghai Kaikai	-7.297 ***
Dalian Referigerator	-4.298 ***	Shanghai Lujiazui Finance & Trade	-4.147 ***
Danhua chemical	-4.125 ***	Shanghai Mechanic and Electrical	-5.217 ***
Dazhong Transportation	-4.742 ***	Shanghai MRA Trading	-3.076
Double Coin	-4.521 ***	Shanghai Nine Dragon	-5.135 ***
Eastern Communications	-5.220 ***	Shanghai Potevio	-5.247 ***
Foshan Electrical	-3.802 **	Shanghai Sanmao	-4.637 ***
Guangdong Electric Power	-2.261	Shanghai Wingsung	-3.542 **
Guangdong Provincial Expressway	-5.041 ***	Shanghai Yaohua Pilkington	-3.371 *
Guandgong Sunrise	-2.450	Shanghai Zhenhua Port Machinery	-4.231 ***
Hainan Airlines	-4.802 ***	Shenzhen SEG	-4.586 ***
Hainan Dadonghai Tourism	-3.405 *	Shenzhen Special Economic Zone	-3.876 **
Hainan Pearl River Holdings	-4.903 ***	Shenzhen Textile	-4.487 ***
Hefei Meiling	-5.235 ***	Shenzhen Accord Pharmaceutical	-4.322 ***
Huadian Energy	-5.201 ***	Shenzhen International Enterprise	-4.112 ***
Huangshan Tourism	-4.280 ***	Shenzhen Nanshan Power	-3.449 **
Huaxin Cement	-4.323 ***	Shenzhen Properties and Resources	-5.381 ***
Inner Mongolia Eerduosica	-2.788	Shenzhen Shenbao Industrial	-5.029 ***
Jiangling Motors	-3.007	Shenzhen Tellus	-4.507 ***
Jinan Qingqi Motorcycle	-4.717 ***	Shenzhen Victor Onward Textile	-4.578 ***
Jinshan Development	-2.294	Shenzhen Zhongheng Huafa	-4.872 ***
Jinzhou Port	-5.504 ***	Shijianzhuang Baoshi	-4.794 ***
Konka Group	-3.838 **	SVA Electron	-3.432 **
Livzon Pharmaceutical	-5.058 ***	Weifu High Technology	-3.274 *
Luthai Textile	-3.620 **	Wuxi Littleswan	-4.414 ***
SGSB Group	-5.585 ***	Yantai Changyu	-4.829 ***
Shangdong Chenming Paper	-3.233 *	Zhong Lu	-4.277 ***
Shanghai Automation Instrument	-4.589 ***		

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level, *** denotes statistical significance at the 1% level*

The Engle-Granger cointegration tests are performed using the natural logarithm return series for all of the dual-listings with a pair-wise analysis. The results are presented in Tables 5.5, 5.6 and 5.7.

When examining the cointegration relationship between the Chinese shares listed in the China A-share and China B-share markets, Table 5.5 presents residuals ADF test statistics for 68 dual-listed A- and B-shares out of 77 cases are more negative than the critical value at statistical significance level at the 10 per cent, 5 per cent and 1 per cent respectively, and hence the null hypothesis of a unit root in the returns is rejected. Therefore, the residuals of the cointegration regression for these 68 dual-listed China A- and B-shares are stationary and thus the two return series are cointegrated in long run. The results also support the Hypothesis 5 for the dual-listed China A- and B-shares, which the China A and B-share markets are cointegrated in terms of the dual-listed securities.

Table 5.6: Engle-Granger Cointegration Test Results for Chinese Firms Dual-Listed on China A-Share and Hong Kong Markets from 1993 to 2008

Pairs	ADF Test Statistics	Pairs	ADF Test Statistics
Air China	-4.652 ***	Guangzhou Pharmaceutical	-2.184
Angang Steel	-2.313	Guangzhou Shipyard	-2.420
Anhui Conch Cement	-2.511	Hisense Kelon	-2.307
Anhui Expressway	-2.832	Huadian Power	-3.447 **
Bank of China	-2.153	Industrial and Commerce Bank	-3.173 *
Bank of Communications	-2.470	Jiangsu Expressway	-2.174
Beijing North Star	-2.430	Jiangxi Cooper	-1.960
Beiren Printing and Machinery	-2.351	Jingwei Textile	-2.561
China Citic Bank	-2.208	Maanshan Iron	-2.025
China Coal Energy	-2.169	Nanjing Panda	-2.843
China Construction Bank	-2.527	Northest Electric	-2.951
China Cosco Holding	-2.495	Ping An Insurance	-3.959 **
China Merchants Bank	-3.851 **	Shangdong Xinhua	-2.873
China Oilfield Services	-3.141 *	Shenji Group	-2.180
China Railway Construction	-3.398 *	Sinopec Yizheng	-3.463 **
China Railway Group	-3.135	Tianjin Capital Environment	-2.787
China Shenhua Energy	-3.444 **	Tsigtao Brewery	-2.763
China Ship Container	-1.775	Weichai Power	-2.577
China Shipping Development	-2.215	Zijin Mining	-3.115
Datang International Power	-3.245 *	ZTE	-4.138 ***
Dongfang Electric	-3.050		

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level*

However, dual-listed Chinese A-shares and H-shares present a different story. Only 11 dual-listed shares out of 41 dual-listings exhibit long run cointegrated relationship. When we use the Engle-Granger cointegration test to examine the relationship among the triple listed Chinese shares, all of the Chinese shares both listed in Hong Kong and New York are cointegrated at one per cent, five per cent and 10 per cent significant level respectively with the *t* values of the residuals are less than the asymptotic critical values for cointegration tests, which states that there is long-run equilibrium relationship between these dual-listed shares. On the contrary, there are fewer cointegrated pairs present in China A-share and H-share, China A-share and N-share.

Three out of 11 dual-listed China A-share and N-share are cointegrated, five out of 11 dual-listed China A-share and H-share are cointegrated.

Table 5.7: Engle-Granger Cointegration Test Results for Chinese Firms Dual-listed on China A-Share, Hong Kong and New York Markets From 1993 to 2008

	China A and Hong Kong Market	China A and New York Market	Hong Kong and New York Market
RI Series	ADF Test Statistics	ADF Test Statistics	ADF Test Statistics
Aluminum	-2.637722	-2.632509	-21.04741 ***
China Eastern Airlines	-2.40858	-3.446604 **	-17.79489 ***
China United Telecom	-3.343515 *	-3.061769	-39.05517 ***
China Life Insurance	-4.279324 ***	-2.202884	-31.57681 ***
China Petrol and Chemical	-2.557852	-2.481381	-9.695143 ***
China Southern Airlines	-3.724875 **	-3.462966 ***	-18.37256 ***
Guangshen Railway	-3.725396 **	-4.405306 ***	-7.164495 ***
Huaneng Power	-3.447375 **	-2.656165	-4.963942 ***
Petro China	-2.297886	-2.172797	-9.130067 ***
Sinopec Shanghai	-2.092308	-2.174753	-6.58175 ***
Yanzhou Coal	-2.477349	-2.357655	-8.388517 ***
China Mobile			-40.61757 ***
China Telecom			-34.62838 ***
CNOOC			-39.07958 ***

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level*

In summary, the results of cointegration tests suggest that the identical stocks that traded both in Hong Kong and New York have some degree of interdependence, so do the China A- and B-share markets, and Hypothesis 5 is not rejected in these two cases. The findings of long-run linkages between New York and Hong Kong for all of the dual-listings suggest that there exist no long-run diversification benefits for investors who invest in these securities. Therefore, the Hong Kong listing could be a good substitute of the New York listing for these dual-listed Chinese securities, but it is not a good idea to pursue an effective diversification of portfolios. However, the Mainland China listing could be included in portfolio to gain from international diversification since the identical listings in Mainland China and New York, or Mainland China and Hong Kong are less cointegrated markets in the context of cross-listing. The highly cointegrated dual-listings for China A- and B-shares also suggesting a more integrated China A- and B-share market. This more integrated phenomenon of the China A-share and B-shares might be attributed to the relaxation of the trading policy and other policies regulated by the Chinese government. Since 2002, the domestic investors holding foreign currency are allowed to trade B-share. Thus, funds managers should be aware of this when they choose the Chinese assets into their portfolio to gain diversification benefits. Overall, it is not surprising to see that to some extent the Chinese market is still maintained as a segmented market to the rest of the world. Regarding to the dual-listings in Mainland China and Hong Kong, more than ten Chinese firms dual-listed in these two markets present long term cointegration

relationship. However, the cointegration analysis in this study concludes there is less connection between them.

5.4.3.3 Johansen Cointegration Test Results

Johansen cointegration tests further confirm the results from the test of Engle-Granger pair-wise cointegration test for the triple-listed Chinese shares. The purpose of Johansen cointegration tests are used is to obtain the cointegration rank. Eigenvalues and trace

Table 5.8: Johansen Cointegration Test Results for Chinese Firms Cross-listed on China A, Hong Kong, and New York Markets

Pair Series	r	Trace Test Statistics	Critical Values 5%	Max-Eigen Test Statistic	Critical Values 5%
Aluminum	0	102.766***	29.797	94.085***	21.132
	1	8.681	15.495	8.673	14.265
	2	0.009	3.841	0.009	3.841
China Eastern Airlines	0	249.620***	29.797	239.346***	21.132
	1	10.274	15.495	6.837	14.265
	2	3.437*	3.841	3.437*	3.841
China United Telecom	0	138.868***	29.797	131.513***	21.132
	1	7.355	15.495	7.106	14.265
	2	0.249	3.841	0.249	3.841
China Life Insurance	0	91.159***	29.797	86.629***	21.132
	1	4.530	15.495	4.072	14.265
	2	0.458	3.841	0.458	3.841
China Petrol and Chemical	0	172.245***	29.797	160.789***	21.132
	1	11.456	15.495	8.853	14.265
	2	2.603	3.841	2.603	3.841
China Southern Airlines	0	173.126***	29.797	160.610***	21.132
	1	12.516	15.495	11.241	14.265
	2	1.274	3.841	1.274	3.841
Guangshen Railway	0	65.292***	29.797	52.374***	21.132
	1	12.918*	15.495	12.894*	14.265
	2	0.024	3.841	0.024	3.841
Huaneng Power	0	50.498***	29.797	37.300***	21.132
	1	13.198	15.495	8.328	14.265
	2	4.870**	3.841	4.870**	3.841
Petro China	0	59.239***	29.797	51.846***	21.132
	1	7.392	15.495	5.098	14.265
	2	2.294	3.841	2.294	3.841
Sinopec Shanghai	0	63.355***	29.797	53.572***	21.132
	1	9.783	15.495	7.125	14.265
	2	2.659	3.841	2.659	3.841
Yanzhou Coal	0	50.386***	29.797	41.533***	21.132
	1	8.853	15.495	6.748	14.265
	2	2.105	3.841	2.105	3.841

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level, *** denotes statistical significance at the 1% level*

r denotes the number of cointegration vectors under the null hypothesis

test statistics are exhibited in Table 5.8. Overall, the null hypothesis that $r = 0$ is rejected in all cases in both the case of the trace test and maximum eigenvalue test, and the null of no cointegrating vectors is rejected at five per cent significance level. Moving on to test the null of at most 1 cointegrating vectors, and at most two cointegrating vectors, both the trace statistic and max-Eigen statistic is now well below the five per cent critical value, suggesting that the null should not be rejected indicating that there are at least one cointegrating vectors. Further, this cointegrating vector existed between Hong Kong and New York dual-listed Chinese shares, which also support the Hypothesis 5 in terms of the dual-listed Chinese H- and N-shares.

5.4.4 Granger Causality Test

Granger causality is applied to examine the information flows for Chinese dual- and triple-listings. The Akaide and Schwarz Bayes Information Criteria are used when choosing the optimal number of lags. Granger's F-statistics for the null hypothesis are reported in Appendices 7.1 to 7.3. If we look at the short run information transmission by using the return series for China A- and B-shares, the null hypothesis of no causality from A-share to B-share or from B-share to A-share could not be easily rejected. However, approximately half of the observation pairs demonstrate one way information transmission either from China A to China B or China B to China A, and Granger causality runs one-way from China A to China B appears more. The similar result also found for the dual-listed China A- and H-shares. Appendix 7.2 demonstrate strong uni-directional causality from Hong Kong to China A. This result is further supported by the study of the triple-listed Chinese A-, H- and N-shares. Panel B of Appendix 7.3 shows that 9 out of 11 pairs show high rejection rates of the null hypothesis that there is no causality from Hong Kong to China A. Panel A of Appendix 7.3 also demonstrates that New York also takes the influential market position to dual-listed Chinese A-shares.

It is generally thought that the US market will dominate most other markets around the world with little influence exerted by these markets to the US market (Yang et al. 2003). On the issue of the Chinese dual-listing, the Granger causality result shows that for the Chinese securities dual-listed in Hong Kong and New York market, the New York series affect Hong Kong series more with a larger F-statistics and the probability values are all lower than 0.05 or close to 0 although substantial information flows also found from Hong Kong to New York market. Unlike the other dual-listing series, the

information flow between Hong Kong and New York are mutually Granger cause each other.

One implication derived from the Granger causality test suggests that the overseas part in the cross-listing securities have the price influence power more than their counterpart of China A-shares. Even the New York Chinese ADRs could affect the dual-listed Mainland Chinese securities to some extent. This result is not consistent with the argument of dominant-satellite proposed by Garbade and Silber (1979), while in the case of Chinese cross-listing, the foreign market acted as the dominate market while China domestic market as the satellite one. Hypothesis 6 is rejected under these empirical results.

5.4.5 Error Correction Model

Based on the unit root tests and cointegration tests in the series involved in all the Chinese dual-listed securities, the tests of them verify that 68 dual-listed China A-share and B-share cases,11 Hong Kong and China A dual-listed shares and 14 Hong Kong-New York dual-listed Chinese shares are *I*(1) stationary and cointegrated. The return correction within these 93 dual-listed cases using error correction model is further examined. We examine the results by splitting them into three groups: China A-share *versus* China B-share, Hong Kong versus China A-share, and Hong Kong *versus* New York. The error correction model (equation 5.32, 5.33, 5.34, 5.35, 5.36, 5.37) then enables us to explore any systematic linkages between these dual-listed share returns. In general, variables of the short run elasticity term of Δx_t and Δy_t, and the market indices both home and abroad are highly significant in explaining the behaviour of share prices for all the 93 cases in the three groups.

The coefficient of determination adjusted R square is larger for the Hong Kong-New York group. In all of the three groups, the error correction factor is sometimes insignificant. For the pairs that have significant error correction factor, this implies that the dual-listed Chinese shares contribute mutually to the price changes, and appear to be rather symmetric in terms of the error correction mechanism, Hypothesis 7 is rejected.

Table 5.9*:* Price Linkage between Dual-Listed Chinese Stocks Traded on China A- and B-share Markets (with Error Correction Model Equation 5.32 when China B returns as Dependent Variable)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Anhui Guijing Distiller	0.000	0.434***	0.008	-0.103***	0.544***	0.451	657.939	3197	2.010
	(-0.156)	(26.920)	(0.545)	(-3.364)	(27.172)				
Bengang Steel Plate	0.000	0.304***	-0.020	-0.050	0.695***	0.563	922.050	2858	1.925
	(0.570)	(16.976)	(-1.474)	(-1.487)	(35.951)				
BOE Technology	0.000	0.524***	-0.037**	-0.129***	0.602***	0.627	874.296	2077	1.994
	(0.072)	(34.404)	(-2.126)	(-3.339)	(21.749)				
Changchai Company	0.000	0.359***	0.020	-0.064**	0.710***	0.558	1014.012	3207	2.015
	(-0.782)	(22.332)	(1.497)	(-2.078)	(36.796)				
China Fanda	0.000	0.339***	-0.037***	-0.091***	0.790***	0.541	978.135	3316	1.989
	(0.468)	(21.699)	(-2.901)	(-2.893)	(38.123)				
China First Pencil	0.000	0.164***	0.052***	-0.165***	0.950***	0.429	785.701	4172	2.103
	(1.013)	(8.777)	(5.168)	(-6.157)	(49.150)				
China Interational Marine Container	0.000	0.285***	-0.010	-0.131***	0.632***	0.385	601.147	3842	1.975
	(1.239)	(16.628)	(-0.857)	(-5.709)	(35.677)				
China Merchants Propert Development	0.000	0.251***	0.047***	-0.111***	0.674***	0.345	536.664	4061	1.975
	(1.056)	(15.852)	(4.192)	(-4.624)	(34.722)				
China Textile Machinery	0.000	0.245***	0.044***	-0.230***	0.829***	0.357	579.692	4172	2.063
	(-0.297)	(14.949)	(4.256)	(-9.100)	(41.088)				
Chongqing Changan Automobile	0.000	0.443***	-0.029**	-0.245***	0.758**	0.476	685.501	3015	1.948
	(0.245)	(21.710)	(-2.020)	(-5.968)	(31.085)				
CSG Holding	0.000	0.249***	-0.015	-0.073***	0.699***	0.404	706.844	4172	1.963
	(0.354)	(18.142)	(-1.396)	(-3.602)	(38.767)				
Dalian Referigerator	0.000	0.295***	-0.014	0.914***	-0.144***	0.497	696.674	2812	1.954
	(-1.052)	(17.453)	(-1.028)	(32.271)	(-6.196)				
Danhua chemical	0.000	0.411***	0.049***	-0.377***	0.875***	0.508	997.969	3862	2.005
	(0.556)	(32.564)	(4.630)	(-16.833)	(47.213)				
Dazhong Transportation	0.000	0.190***	0.011	-0.220***	0.996***	0.540	1224.312	4172	2.016
	(0.962)	(12.457)	(1.251)	(-10.286)	(61.649)				
Double Coin	0.000	0.166***	0.007	-0.193***	1.080***	0.556	1305.146	4172	2.139
	(-0.482)	(11.207)	(0.775)	(-8.693)	(63.818)				
Eastern Communications	0.000	0.319***	-0.028**	-0.279***	0.917***	0.557	992.199	3155	1.977
	(0.407)	(19.113)	(-2.247)	(-8.353)	(43.599)				
Foshan Electrical	0.000	0.284***	0.050***	-0.066***	0.584***	0.467	767.143	3495	2.025
	(1.002)	(17.102)	(4.038)	(-2.607)	(35.819)				
Guangdong Provincial Expressway	0.000	0.277***	0.049***	-0.091***	0.612***	0.438	553.704	2832	2.053
	(0.428)	(13.404)	(3.368)	(-2.665)	(29.247)				
Hainan Airlines	0.000	0.446***	0.041***	-0.371***	0.889***	0.669	1197.235	2373	2.086
	(-0.571)	(28.022)	(2.875)	(-10.693)	(39.749)				
Hainan Dadonghai Tourism	0.000	0.436***	0.013	-0.047	0.431***	0.353	425.455	3110	2.007
	(-0.627)	(27.983)	(0.898)	(-1.337)	(18.306)				
Hainan Pearl River Holdings	0.000	0.460***	0.134***	-0.144***	0.626***	0.304	384.634	3522	2.053
	(-0.246)	(22.870)	(9.176)	(-3.223)	(19.971)				
Hefei Meiling	0.000	0.341***	-0.028**	-0.049	0.724***	0.485	757.635	3219	1.998
	(-0.390)	(17.632)	(-2.025)	(-1.385)	(32.790)				
Huadian Energy	0.000	0.143***	-0.004	-0.197***	1.043***	0.699	1895.263	3261	2.039
	(0.201)	(9.431)	(-0.397)	(-7.955)	(69.217)				
Huangshan Tourism	0.000	0.280***	0.026**	-0.261***	0.904***	0.587	1079.231	3040	1.932
	(0.628)	(16.298)	(2.184)	(-8.565)	(18.184)				
Huaxin Cement	0.001	0.253***	0.046***	-0.255***	0.964***	0.484	860.577	3667	2.011
	(1.304)	(14.082)	(3.976)	(-8.240)	(46.196)				
Jinan Qingqi Motorcycle	0.000	0.377***	0.057***	-0.244***	0.809***	0.569	992.532	3010	2.026
	(-0.488)	(25.041)	(4.542)	(-8.422)	(43.309)				
Jinzhou Port	0.000	0.339***	-0.020*	-0.256***	0.942***	0.756	1930.031	2494	1.966
	(0.255)	(24.475)	(-1.704)	(-9.318)	(53.702)				
Konka Group	0.000	0.203***	0.008	0.674***	0.059***	0.453	863.489	4172	2.001
	(-0.367)	(14.786)	(0.741)	(43.980)	(3.275)				
Livzon Pharmaceutical	0.000	0.303***	0.041***	-0.154***	0.724***	0.383	614.034	3958	2.041
	(0.756)	(18.406)	(3.549)	(-6.318)	(36.291)				
Luthai Textile	0.001	0.404***	-0.037**	-0.107***	0.590***	0.594	766.293	2091	1.954
	(1.619)	(23.553)	(-2.272)	(-3.113)	(25.607)				
SGSB Group	0.000	0.165***	0.031***	-0.153***	1.016***	0.493	938.304	3862	2.144
	(-0.338)	(11.379)	(3.210)	(-6.100)	(52.060)				
Shangdong Chenming Paper	0.000	0.343***	-0.019	-0.064*	0.638***	0.603	804.478	2116	1.959
	(1.033)	(18.686)	(-1.234)	(-1.791)	(27.697)				
Shanghai Automation Instrument	0.000	0.356***	0.044***	-0.375***	0.959***	0.524	1052.001	3827	2.051
	(0.521)	(24.105)	(4.305)	(-15.234)	(51.655)				
Shanghai Baosight	0.001	0.316***	0.026**	-0.291***	0.882***	0.296	406.626	3859	2.036
	(1.0690	(15.139)	(2.120)	(-8.273)	(32.656)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

(continued)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Shanghai Diesel	0.000	0.215***	-0.012	-0.254***	1.042***	0.556	1208.156	3862	2.005
	(0.196)	(14.161)	(-1.275)	(-10.822)	(59.663)				
Shanghai Dingli Technology	0.000	0.220***	0.023	-0.135***	0.737***	0.314	442.412	3862	2.108
	(0.608)	(13.431)	(1.915)	(-4.913)	(33.267)				
Shanghai Erfangji	0.000	0.238***	0.076***	-0.248***	1.070***	0.541	1288.452	4172	2.116
	(-0.279)	(16.255)	(8.213)	(-10.871)	(60.152)				
Shanghai Friendship	0.000	0.115***	0.043***	-0.106***	0.898***	0.518	1044.012	3887	2.131
	(1.250)	(7.756)	(4.725)	(-4.679)	(56.041)				
Shanghai Highly Group	0.000	0.200***	0.035***	-0.198***	0.991***	0.503	1054.235	4161	2.073
	(0.882)	(12.625)	(3.637)	(-8.581)	(56.117)				
Shanghai Jinjiang Hotel	0.000	0.254***	0.075***	-0.308***	0.964***	0.635	1386.012	3187	2.100
	(0.378)	(15.953)	(6.836)	(-10.959)	(56.792)				
Shanghai Jinjiang International	0.000	0.135***	0.049***	-0.117***	0.941***	0.486	938.996	3966	2.082
	(0.934)	(7.754)	(4.955)	(-4.504)	(52.528)				
Shanghai Jinqiao	0.000	0.257***	0.070***	-0.245***	0.977***	0.576	1382.120	4066	2.027
	(0.883)	(16.843)	(7.478)	(-11.182)	(62.420)				
Shanghai Kaikai	0.000	0.239***	-0.032***	-0.154***	0.949***	0.663	1001.123	2044	1.928
	(-0.508)	(22.527)	(-2.837)	(-4.249)	(35.722)				
Shanghai Lujiazui Finance & Trade Zone	0.000	0.269***	0.034***	-0.304***	0.983***	0.696	2106.231	3680	1.982
	(1.001)	(20.865)	(3.781)	(-15.192)	(73.863)				
Shanghai Mechanic and Electrical	0.000	0.176***	0.025**	-0.157***	0.944***	0.481	896.763	3873	2.033
	(0.864)	(10.996)	(2.456)	(-6.290)	(50.949)				
Shanghai Nine Dragon	0.000	0.458***	0.014	-0.329***	0.717***	0.594	738.438	2024	1.871
	(0.087)	(27.723)	(0.837)	(-8.241)	(25.459)				
Shanghai Potevio	0.000	0.270***	0.030***	-0.265***	0.953***	0.562	1189.011	3703	2.096
	(0.225)	(19.397)	(2.922)	(-10.758)	(54.196)				
Shanghai Sanmao	0.000	0.309***	0.021*	-0.287***	0.894***	0.422	715.442	3911	2.090
	(0.517)	(18.511)	(1.899)	(-10.416)	(42.181)				
Shanghai Wingsung	0.000	0.283***	0.060***	-0.177***	0.799***	0.319	488.717	4172	2.084
	(-0.080)	(16.279)	(5.111)	(-6.811)	(34.916)				
Shanghai Yaohua Pilkington	0.000	0.191***	0.049***	-0.226***	0.931***	0.486	919.999	3892	2.175
	(-0.127)	(12.540)	(5.019)	(-9.730)	(52.848)				
Shanghai Zhenhua Port Machinery	0.001	0.393***	-0.009	-0.396***	0.886***	0.610	819.576	2093	1.883
	(1.630)	(20.422)	(-0.591)	(-10.436)	(34.789)				
Shenzhen SEG	0.000	0.379***	-0.023*	-0.028	0.619***	0.488	747.017	3133	2.003
	(-0.674)	(24.062)	(-1.671)	(-0.832)	(28.929)				
Shenzhen Special Economic Zone	0.000	0.364***	0.025**	-0.135***	0.741***	0.442	773.132	3906	2.028
	(-0.325)	(24.062)	(2.114)	(-5.504)	(36.087)				
Shenzhen Textile	0.000	0.300***	0.012	-0.133***	0.742***	0.331	463.845	3751	1.946
	(0.184)	(16.169)	(0.952)	(-4.015)	(29.715)				
Shenzhen Accord Pharmaceutical	0.000	0.260***	0.022*	-0.085***	0.712***	0.308	448.305	4015	1.982
	(0.719)	(14.629)	(1.846)	(-3.014)	(30.988)				
Shenzhen International Enterprise	0.000	0.480***	0.002	-0.248***	0.650***	0.425	598.088	3235	1.984
	(0.193)	(27.112)	(0.107)	(-6.361)	(25.521)				
Shenzhen Nanshan Power	0.000	0.358***	0.066***	-0.150***	0.648***	0.379	561.081	3676	2.014
	(0.634)	(19.910)	(5.105)	(-4.983)	(30.595)				
Shenzhen Properties and Resources	0.000	0.396***	-0.001	-0.149***	0.602***	0.311	471.600	4172	1.984
	(-0.446)	(23.000)	(-0.111)	(-6.021)	(27.561)				
Shenzhen Shenbao Industrial	0.000	0.276***	0.071***	-0.045	0.537***	0.207	272.441	4172	1.968
	(-0.002)	(15.221)	(5.631)	(-1.574)	(20.597)				
Shenzhen Tellus	0.000	0.403***	0.101***	-0.245***	0.563***	0.221	286.236	5041	2.008
	(-0.095)	(20.390)	(7.722)	(-7.131)	(19.576)				
Shenzhen Victor Onward Textile	0.000	0.232***	0.060***	-0.072***	0.649***	0.200	260.915	4172	1.979
	(-0.311)	(11.558)	(4.803)	(-2.345)	(23.589)				
Shenzhen Zhongheng Huafa	0.000	0.228***	0.033***	-0.093***	0.579***	0.200	261.262	4172	1.908
	(-0.277)	(15.203)	(2.940)	(-3.589)	(23.759)				
Shijianzhuang Baoshi	0.000	0.422***	-0.026*	-0.079**	0.621***	0.474	721.436	3199	1.952
	(-0.516)	(27.262)	(-1.887)	(-2.413)	(28.543)				
SVA Electron	0.000	0.274***	0.081***	-0.259***	0.922***	0.479	960.880	4172	2.161
	(0.150)	(17.292)	(8.233)	(-10.801)	(51.395)				
Weifu High Technology	0.000	0.320***	0.018	-0.013	0.631***	0.502	676.879	2678	1.973
	(-0.079)	(16.818)	(1.230)	(-0.350)	(26.989)				
Wuxi Littleswan	0.000	0.357***	-0.010	-0.153***	0.702***	0.507	785.885	3067	2.044
	(-0.396)	(21.682)	(-0.749)	(-4.589)	(34.172)				
Yantai Changyu	0.001	0.291***	-0.025	-0.073*	0.581***	0.409	370.450	2133	1.959
	(2.384)	(13.352)	(-1.517)	(-1.891)	(21.598)				
Zhong Lu	0.000	0.306***	-0.002	-0.218***	0.725***	0.336	493.738	3892	2.015
	(0.036)	(19.164)	(-0.208)	(-8.190)	(33.783)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

Table 5.10: Price Linkage between Dual-Listed Chinese Stocks Traded on China A- and B-share Markets (with Error Correction Model Equation 5.33 when China A Returns as Dependent Variable)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Anhui Guijing Distiller	0.000	0.427***	0.034**	0.696***	-0.198***	0.412	559.797	3197	1.865
	(-0.972)	(26.920)	(2.437)	(25.079)	(-9.121)				
Bengang Steel Plate	0.000	0.302***	0.005	0.981***	-0.199***	0.509	740.144	2858	1.920
	(-0.774)	(16.976)	(0.388)	(36.641)	(-8.708)				
BOE Technology	0.000	0.694***	0.043**	0.600***	-0.281***	0.546	624.114	2077	1.972
	(-0.723)	(34.404)	(2.159)	(14.085)	(-8.084)				
Changchai Company	0.000	0.375***	0.024*	0.893***	-0.165***	0.501	805.223	3207	1.937
	(-1.337)	(22.332)	(1.791)	(32.426)	(-7.050)				
China Fanda	0.000	0.367***	0.031**	0.896***	-0.152***	0.464	717.801	3316	1.971
	(-0.959)	(21.699)	(2.347)	(31.011)	(-5.912)				
China First Pencil	0.000	0.111***	0.001	1.029***	-0.044**	0.585	1471.012	4172	2.031
	(0.008)	(8.777)	(0.085)	(66.820)	(-2.180)				
China Interational Marine Container	0.000	0.236***	-0.002	0.797***	-0.049**	0.505	980.050	3842	1.973
	(0.806)	(16.628)	(-0.203)	(48.027)	(-2.645)				
China Merchants Propert Development	0.000	0.233***	-0.015	0.858***	-0.083***	0.445	815.793	4061	1.928
	(0.319)	(15.852)	(-1.405)	(45.208)	(-3.911)				
China Textile Machinery	0.000	0.207***	-0.005	0.972***	-0.180***	0.477	952.528	4172	1.935
	(-0.461)	(14.949)	(-0.484)	(54.048)	(-8.235)				
Chongqing Changan Automobile	0.000	0.305***	0.013	1.005***	-0.232***	0.485	709.241	3015	2.000
	(-0.566)	(21.710)	(1.115)	(34.765)	(-10.336)				
CSG Holding	0.000	0.294***	0.011	0.725***	-0.042*	0.404	707.082	4172	1.931
	(0.184)	(18.142)	(0.941)	(38.350)	(-1.858)				
Dalian Referigerator	0.000	0.331***	0.012	-0.155***	0.718***	0.533	801.568	2812	2.031
	(0.185)	(17.453)	(0.855)	(-4.428)	(34.481)				
Danhua chemical	0.000	0.524***	-0.030**	0.928***	-0.446***	0.476	877.936	3862	1.955
	(-0.286)	(32.564)	(-2.522)	(43.110)	(-17.616)				
Dazhong Transportation	0.000	0.189***	0.012	0.970***	-0.100***	0.561	1331.234	4172	1.950
	(0.559)	(12.457)	(1.301)	(62.479)	(-4.511)				
Double Coin	0.000	0.176***	0.021**	1.015***	-0.099***	0.542	1233.235	4172	1.999
	(-1.313)	(11.207)	(2.300)	(60.242)	(-4.063)				
Eastern Communications	0.000	0.326***	0.035***	0.952***	-0.178***	0.452	652.469	3155	1.918
	(-0.960)	(19.113)	(2.760)	(32.125)	(-6.656)				
Foshan Electrical	0.000	0.272***	-0.007	0.781***	-0.072***	0.475	790.644	3495	1.953
	(0.050)	(17.102)	(-0.543)	(37.237)	(-3.858)				
Guangdong Provincial Expressway	0.000	0.216***	-0.001	0.771***	-0.061***	0.432	539.316	2832	1.873
	(-0.736)	(13.404)	(-0.089)	(28.891)	(-2.918)				
Hainan Airlines	0.000	0.558***	-0.012	0.961***	-0.406***	0.559	750.412	2373	2.014
	(-0.385)	(28.022)	(-0.779)	(27.931)	(-13.027)				
Hainan Dadonghai Tourism	0.000	0.462***	-0.038**	0.603***	-0.244***	0.318	363.239	3110	1.974
	(-1.026)	(27.983)	(-2.556)	(17.428)	(-9.716)				
Hainan Pearl River Holdings	0.000	0.282***	-0.029**	0.824***	-0.125***	0.343	460.879	3522	1.889
	(-0.163)	(22.870)	(-2.490)	(25.644)	(-4.847)				
Hefei Meiling	0.000	0.259***	0.021*	0.872***	-0.078***	0.470	715.487	3219	1.937
	(-1.403)	(17.632)	(1.746)	(32.671)	(-3.536)				
Huadian Energy	0.000	0.186***	0.016	0.937***	-0.121***	0.474	735.263	3261	1.943
	(-1064)	(9.431)	(1.503)	(39.904)	(-4.503)				
Huangshan Tourism	0.000	0.288***	-0.003	0.855***	-0.195***	0.419	549.425	3040	2.013
	(-0.062)	(16.298)	(-0.284)	(31.421)	(-7.797)				
Huaxin Cement	0.000	0.203***	-0.008	1.014***	-0.091***	0.494	894.297	3667	1.974
	(-0.222)	(14.082)	(-0.757)	(45.267)	(-3.857)				
Jinan Qingqi Motorcycle	0.000	0.459***	-0.019	0.679***	-0.336***	0.350	406.006	3010	1.897
	(-1.043)	(25.041)	(--1.350)	(22.718)	(-13.132)				
Jinzhou Port	0.000	0.572***	0.043***	0.890***	-0.430***	0.544	741.559	2494	1.984
	(-0.668)	(24.475)	(2.808)	(28.209)	(-13.301)				
Konka Group	0.000	0.246***	-0.026**	-0.097***	0.581***	0.325	505.545	4172	1.984
	(0.176)	(14.786)	(-2.290)	(-4.778)	(32.928)				
Livzon Pharmaceutical	0.000	0.261***	-0.009	0.806***	-0.077***	0.450	808.858	3958	1.954
	(0.318)	(18.406)	(-0.818)	(42.795)	(-3.589)				
Luthai Textile	0.000	0.519***	0.062***	0.747***	-0.230***	0.521	568.416	2091	1.952
	(-0.059)	(23.553)	(3.408)	(21.169)	(-7.795)				
SGSB Group	0.000	0.197***	0.013	1.033***	-0.139***	0.453	797.102	3862	1.962
	(-0.871)	(11.379)	(1.257)	(47.132)	(-4.998)				
Shangdong Chenming Paper	0.000	0.414***	0.039**	0.846***	-0.171***	0.543	629.768	2116	1.966
	(-0.500)	(18.686)	(2.230)	(24.642)	(-5.823)				
Shanghai Automation Instrument	0.000	0.371***	-0.029***	1.049***	-0.297***	0.544	1140.032	3827	1.913
	(-1.040)	(24.105)	(-2.713)	(53.695)	(-12.279)				
Shanghai Baosight	0.000	0.178***	0.012	1.030***	-0.185***	0.464	834.418	3859	1.969
	(-0.846)	(15.139)	(1.303)	(49.500)	(-8.163)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

(continued)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Shanghai Diesel	0.000	0.230***	0.007	1.004***	-0.169***	0.522	1056.341	3862	1.891
	(-0.798)	(14.161)	(0.664)	(54.274)	(-6.794)				
Shanghai Dingli Technology	0.000	0.182***	0.027***	0.951***	-0.121***	0.444	834.907	3862	1.918
	(-0.394)	(12.829)	(2.744)	(49.710)	(-5.432)				
Shanghai Erfangji	0.000	0.254***	-0.015	1.025***	-0.193***	0.530	1176.453	4172	1.976
	(-1.120)	(16.255)	(-1.514)	(58.076)	(-7.811)				
Shanghai Friendship	0.000	0.133***	-0.023**	1.039***	-0.103***	0.541	1146.231	3887	2.054
	(0.176)	(7.756)	(-2.369)	(58.770)	(-4.467)				
Shanghai Highly Group	0.000	0.184***	0.014	0.989***	-0.089***	0.551	1276.483	4161	1.938
	(-0.810)	(12.625)	(1.500)	(60.714)	(-3.987)				
Shanghai Jinjiang Hotel	0.000	0.292***	-0.016	0.992***	-0.187***	0.500	796.891	3187	1.955
	(-0.388)	(15.953)	(-1.368)	(39.406)	(-7.288)				
Shanghai Jinjiang International	0.000	0.110***	0.006	1.057***	-0.040*	0.590	1426.412	3966	2.020
	(-0.649)	(7.754)	(0.671)	(64.333)	(-1.908)				
Shanghai Jinqiao	0.000	0.254***	-0.025***	0.996***	-0.158***	0.594	1485.021	4066	1.958
	(-0.532)	(16.843)	(-2.728)	(63.870)	(-7.290)				
Shanghai Kaikai	0.000	0.834***	-0.033	0.794***	-0.580***	0.365	294.240	2044	2.013
	(-0.331)	(22.527)	(-1.552)	(12.122)	(-9.343)				
Shanghai Lujiazui Finance & Trade Zone	0.000	0.394***	-0.007	0.960***	-0.287***	0.546	1108.001	3680	1.962
	(-0.796)	(20.865)	(-0.662)	(49.852)	(-11.502)				
Shanghai Mechanic and Electrical	0.000	0.172***	-0.025**	1.012***	-0.120***	0.510	1010.101	3873	1.925
	(0.077)	(10.993)	(-2.489)	(53.788)	(-5.079)				
Shanghai Nine Dragon	0.000	0.602***	0.042**	0.920***	-0.337***	0.554	629.969	2024	2.048
	(-0.753)	(27.723)	(2.253)	(22.054)	(-9.278)				
Shanghai Potevio	0.000	0.342***	0.001	0.954***	-0.226***	0.455	773.521	3703	2.002
	(-0.824)	(19.397)	(0.082)	(40.953)	(-8.616)				
Shanghai Sanmao	0.000	0.261***	-0.002	1.007***	-0.143***	0.505	998.232	3911	2.010
	(-0.594)	(18.511)	(-0.209)	(50.445)	(-6.115)				
Shanghai Wingsung	0.000	0.211***	-0.011	0.779***	-0.087***	0.382	645.592	4172	1.896
	(-0.666)	(16.279)	(-1.108)	(40.752)	(-3.884)				
Shanghai Yaohua Pilkington	0.000	0.203***	-0.009	0.969***	-0.145***	0.490	934.389	3892	1.877
	(-0.754)	(12.540)	(-0.920)	(52.004)	(-6.148)				
Shanghai Zhenhua Port Machinery	0.000	0.424***	0.013	0.904***	-0.261***	0.521	569.258	2093	1.937
	(0.800)	(20.422)	(0.779)	(25.667)	(-7.977)				
Shenzhen SEG	0.000	0.412***	0.024*	0.781***	-0.200***	0.411	546.445	3133	1.922
	(-0.829)	(24.062)	(1.678)	(24.366)	(-8.033)				
Shenzhen Special Economic Zone	0.000	0.355***	-0.015	0.792***	-0.107***	0.461	836.981	3906	1.927
	(-0.674)	(24.062)	(-1.276)	(38.196)	(-4.568)				
Shenzhen Textile	0.000	0.218***	0.023**	0.913***	-0.053**	0.422	684.094	3751	1.948
	(-0.380)	(16.169)	(2.133)	(38.161)	(-2.235)				
Shenzhen Accord Pharmaceutical	0.000	0.195***	-0.014	0.865***	-0.065***	0.420	727.354	4015	1.918
	(0.198)	(14.629)	(-1.318)	(42.532)	(-2.927)				
Shenzhen International Enterprise	0.000	0.387***	0.021	0.900***	-0.159***	0.452	669.068	3235	1.933
	(-0.543)	(27.112)	(1.626)	(28.552)	(-6.394)				
Shenzhen Nanshan Power	0.000	0.272***	-0.020*	0.860***	-0.113***	0.452	760.182	3676	1.958
	(-0.685)	(19.910)	(-1.814)	(38.604)	(-5.483)				
Shenzhen Properties and Resources	0.000	0.285***	-0.033***	0.642***	-0.050**	0.391	671.739	4172	1.942
	(-0.776)	(23.000)	(-3.080)	(35.896)	(-2.483)				
Shenzhen Shenbao Industrial	0.000	0.191***	-0.027**	0.721***	0.058**	0.346	553.757	4172	1.985
	(-0.564)	(15.221)	(-2.543)	(34.405)	(2.547)				
Shenzhen Tellus	0.000	0.231***	-0.042***	0.891***	-0.043*	0.414	715.281	5041	1.904
	(-0.734)	(20.390)	(-4.204)	(40.302)	(-1.903)				
Shenzhen Victor Onward Textile	0.000	0.134***	-0.022**	0.766***	0.051**	0.356	578.249	4172	1.986
	(-0.869)	(11.558)	(-2.289)	(37.829)	(2.272)				
Shenzhen Zhongheng Huafa	0.000	0.231***	-0.013	0.702***	-0.090***	0.254	355.370	4172	1.963
	(-0.777)	(15.203)	(-1.154)	(29.502)	(-3.441)				
Shijianzhuang Baoshi	0.000	0.447***	0.031**	0.700***	-0.219***	0.392	515.460	3199	1.975
	(-0.709)	(27.262)	(2.211)	(22.388)	(-8.845)				
SVA Electron	0.000	0.245***	-0.024***	1.039***	-0.155***	0.574	1404.234	4172	2.019
	(-0.681)	(17.292)	(-2.623)	(63.310)	(-7.215)				
Weifu High Technology	0.000	0.299***	-0.025*	0.913***	-0.115***	0.483	627.431	2678	1.954
	(0.037)	(16.818)	(-1.730)	(27.863)	(-4.506)				
Wuxi Littleswan	0.000	0.373***	0.027**	0.895***	-0.216***	0.440	603.385	3067	1.986
	(-1.000)	(21.682)	(1.984)	(29.611)	(-8.854)				
Yantai Changyu	0.000	0.266***	0.034**	0.615***	-0.115***	0.326	258.700	2133	1.891
	(0.979)	(13.352)	(2.111)	(17.717)	(-4.055)				
Zhong Lu	0.000	0.283***	0.005	0.913***	-0.201***	0.423	714.626	3892	1.933
	(-0.385)	(19.164)	(0.412)	(43.032)	(-8.645)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

Table 5.11: Price Linkage between Dual-Listed Chinese Stocks Traded on China A and Hong Kong Markets (with Error Correction Model Equation 5.34 when Hong Kong Returns as Dependent Variable)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Air China	0.000	0.333***	0.000	1.142***	-0.113	0.543	184.485	618	1.975
	(0.137)	(8.576)	(-2.31)	(20.261)	(-1.512)				
China Merchants Bank	0.000	0.255***	0.001	1.097***	-0.086*	0.737	416.092	593	1.925
	(-0.093)	(7.147)	(0.249)	(29.880)	(-1.746)				
China Oilfield Services	0.041	0.332***	0.014	1.372***	-0.187*	0.639	145.995	328	1.987
	(1.440)	(4.569)	(1.447)	(18.789)	(-1.630)				
China Railway Construction	0.007**	0.681***	0.094***	0.616***	-0.321**	0.471	47.230	209	2.376
	(2.453)	(7.128)	(3.465)	(7.760)	(-2.512)				
China Shenhua Energy	0.028	0.355***	0.014	1.292***	-0.271***	0.701	188.141	321	2.028
	(1.246)	(5.419)	(1.248)	(21.615)	(-2.938)				
Datang International Power	0.005	0.136***	0.005	1.123***	0.024	0.476	121.154	530	1.822
	(1.159)	(2.996)	(1.074)	(17.738)	(0.295)				
Huadian Power	0.002	0.089***	0.003	0.965***	0.074	0.331	126.930	1019	1.952
	(0.706)	(2.705)	(0.901)	(18.648)	(1.215)				
Industrial and Commerce Bank	0.000	0.291***	0.002	1.058***	-0.221***	0.795	551.508	568	2.022
	(0.267)	(8.132)	(0.494)	(38.956)	(-5.540)				
Ping An Insurance	0.005	0.290***	0.002	1.091***	-0.013	0.745	349.962	479	1.836
	(0.835)	(7.151)	(0.653)	(25.014)	(-0.222)				
Sinopec Yizheng	-0.003**	0.217***	0.003**	0.968***	-0.030	0.198	222.270	3581	1.891
	(-2.545)	(7.867)	(2.322)	(27.115)	(-0.675)				
ZTE	-0.022***	0.384***	0.013***	0.922***	-0.140***	0.398	175.639	1059	2.045
	(-2.769)	(11.688)	(2.776)	(19.472)	(-2.826)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

Table 5.12: Price Linkage between Dual-Listed Chinese Stocks Traded on China A and Hong Kong Markets (with Error Correction Model Equation 5.35 when China A Returns as Dependent Variable)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Air China	0.002	0.322***	-0.003	-0.475***	1.187***	0.548	185.548	618	1.954
	(0.790)	(8.576)	(-0.717)	(-6.882)	(21.133)				
China Merchants Bank	0.007	0.314***	-0.009	-0.086	0.923***	0.661	289.514	593	2.032
	(1.450)	(7.147)	(-1.433)	(-1.340)	(23.561)				
China Oilfield Services	-0.037*	0.183***	-0.015*	-0.237***	1.070***	0.593	120.048	328	1.886
	(-1.740)	(4.569)	(-1.749)	(-3.062)	(17.431)				
China Railway Construction	-0.002	0.293***	-0.053***	-0.239***	0.871***	0.657	100.771	209	2.121
	(-0.925)	(7.128)	(-2.951)	(-4.162)	(14.709)				
China Shenhua Energy	-0.036**	0.239***	-0.018**	-0.232***	0.950***	0.701	188.141	321	2.028
	(-1.996)	(5.419)	(-1.968)	(-3.047)	(17.283)				
Datang International Power	0.001	0.124***	0.000	-0.151**	1.101***	0.615	128.670	530	1.759
	(0.175)	(2.996)	(-0.017)	(-1.981)	(18.208)				
Huadian Power	-0.002	0.080***	-0.001	-0.189***	1.094***	0.400	170.446	1019	1.841
	(-0.660)	(2.705)	(-0.497)	(-3.340)	(23.769)				
Industrial and Commerce Bank	0.002*	0.361***	-0.010**	-0.283***	0.827***	0.685	308.670	568	1.774
	(1.831)	(8.132)	(-2.412)	(-4.966)	(28.075)				
Ping An Insurance	-0.007	0.336***	-0.005	-0.061	0.839***	0.636	210.099	479	1.946
	(-1.215)	(7.151)	(-1.150)	(-0.852)	(17.553)				
Sinopec Yizheng	0.001	0.078***	-0.002**	-0.161***	1.041***	0.450	734.573	3581	1.948
	(1.786)	(7.867)	(-2.353)	(-6.877)	(52.063)				
ZTE	0.002	0.299***	0.000	-0.235***	0.669***	0.348	142.044	1059	1.893
	(0.249)	(11.688)	(-0.234)	(-4.886)	(17.285)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

Table 5.13*:* Price Linkage between Dual-Listed Chinese Stocks Traded on Hong Kong and New York Markets (with Error Correction Model Equation 5.36 when New York Returns as Dependent Variable)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Aluminum	0.000	0.708***	0.030*	1.280***	-0.333***	0.632	789.850	1840	2.615
	(-0.584)	(37.369)	(1.850)	(32.327)	(-7.602)				
China Eastern Airlines	-0.015***	0.679***	0.146***	0.819***	-0.204***	0.571	1035.601	3105	2.719
	(-13.964)	(53.329)	(15.336)	(23.347)	(-7.291)				
China Life Insurance	0.001	0.828	-0.039	1.249	-0.529	0.642	590.679	1314	2.607
	(1.976)	(27.433)	(-1.962)	(31.728)	(-10.786)				
China Mobile	0.000	0.846***	0.028**	1.154***	-0.485***	0.609	1138.125	2919	2.516
	(-1.292)	(38.369)	(2.004)	(43.312)	(-14.647)				
China Petrol and Chemical	0.000	0.754***	0.003	0.933***	-0.298***	0.602	810.985	2139	2.748
	(0.060)	(37.813)	(0.232)	(30.382)	(-8.560)				
China Southern Airlines	0.001	0.724***	0.098***	0.990***	-0.223***	0.613	1180.092	2978	2.653
	(1.551)	(56.126)	(9.629)	(28.516)	(-8.054)				
China Telecom	0.000	0.842***	-0.011	1.304***	-0.476***	0.745	1167.859	1598	2.468
	(-0.316)	(41.156)	(-0.768)	(42.930)	(-13.816)				
China United Telecom	0.001	0.762***	-0.025*	1.323***	-0.441***	0.667	1113.515	2224	2.444
	(1.507)	(39.671)	(-1.707)	(43.700)	(-12.453)				
CNOOC	0.001	0.640***	0.009	-0.015	0.068**	0.381	334.059	2161	2.741
	(0.637)	(36.518)	(0.470)	(-0.359)	(1.990)				
Guangshen Railway	0.002***	0.663***	0.015***	0.792***	-0.180***	0.518	886.649	3296	2.503
	(2.750)	(49.869)	(3.408)	(27.884)	(-8.019)				
Huaneng Power	0.002***	0.638***	0.032***	0.935***	-0.175***	0.544	851.348	2855	2.559
	(2.924)	(45.075)	(3.661)	(30.581)	(-6.723)				
Petro China	-0.001	0.681***	0.018	0.864***	-0.226***	0.570	756.195	2278	2.663
	(-0.970)	(36.375)	(1.387)	(32.062)	(-7.764)				
Sinopec Shanghai	-0.002***	0.721***	0.031***	0.946***	-0.240***	0.619	1634.586	4026	2.591
	(-4.371)	(67.752)	(5.749)	(32.840)	(-10.780)				
Yanzhou Coal	0.005***	0.715***	0.063***	0.720***	-0.135***	0.588	1000.741	2804	2.648
	(6.607)	(51.612)	(7.999)	(20.878)	(-4.389)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

Table 5.14*:* Price Linkage between Dual-Listed Chinese Stocks Traded on Hong Kong and New York Markets (with Error Correction Model Equation 5.37 when Hong Kong Returns as Dependent Variable)

	β_0	β_1	γ_2	γ_3	γ_4	Ajusted R square	F	N	Durbin Watson
Aluminum	0.000	0.610***	0.031***	-0.843***	1.045***	0.670	935.690	1840	2.430
	(-1.322)	(37.369)	(2.049)	(-20.253)	(31.451)				
China Eastern Airlines	0.009***	0.705***	-0.094***	-0.601***	0.658***	0.585	1094.356	3105	2.478
	(8.561)	(53.329)	(-9.467)	(-16.148)	(25.139)				
China Life Insurance	0.000	0.441***	0.040***	-0.573***	1.042***	0.762	1055.892	1314	2.318
	(-0.988)	(27.433)	(2.786)	(-16.501)	(43.825)				
China Mobile	0.000	0.397***	0.004	-0.489***	1.004***	0.779	2573.142	2919	2.166
	(0.266)	(38.369)	(0.393)	(-22.690)	(70.102)				
China Petrol and Chemical	-0.001	0.532***	0.019	-0.493***	0.857***	0.377	1119.231	2139	2.416
	(-1.350)	(37.813)	(1.607)	(-17.012)	(37.014)				
China Southern Airlines	0.000	0.710***	-0.060***	-0.694***	0.629***	0.616	1193.346	2978	2.407
	(-1.359)	(56.126)	(-5.940)	(-18.930)	(25.000)				
China Telecom	0.000	0.612***	0.013	-0.789***	0.876***	0.770	1336.145	1598	2.400
	(0.644)	(41.156)	(1.009)	(-24.260)	(39.729)				
China United Telecom	-0.001***	0.545***	0.038***	-0.723***	0.996***	0.709	1354.465	2224	2.341
	(-2.685)	(39.671)	(3.085)	(-23.048)	(44.125)				
CNOOC	0.001	0.597***	0.006	-0.001	-0.068***	0.382	334.209	2161	2.582
	(0.517)	(36.518)	(0.317)	(-0.033)	(-2.085)				
Guangshen Railway	-0.002***	0.649***	-0.018***	-0.571***	0.540***	0.540	969.609	3296	2.485
	(-3.224)	(49.869)	(-4.028)	(-19.292)	(26.453)				
Huaneng Power	0.000	0.653***	-0.018**	-0.616***	0.597***	0.536	825.772	2855	2.465
	(-1.324)	(45.075)	(-1.957)	(-18.289)	(24.797)				
Petro China	0.002	0.540***	-0.017	-0.485***	0.748***	0.631	972.779	2278	2.457
	(1.695)	(36.375)	(-1.466)	(-17.913)	(35.650)				
Sinopec Shanghai	0.002***	0.739***	-0.028***	-0.734***	0.657***	0.646	1838.651	4026	0.465
	(3.791)	(67.752)	(-5.122)	(-23.896)	(32.170)				
Yanzhou Coal	-0.003***	0.682***	-0.041***	-0.481***	0.652***	0.615	1121.423	2804	2.431
	(-4.117)	(51.612)	(-5.236)	(-13.746)	(23.745)				

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level, N presentate number of observations*

The error correction estimates also correspond to the above results of Granger causality, which suggested that new information is realised in both markets and thus there is no pure dominant-satellite market relationship between the dual-listed markets. In this case, both returns react to the pricing error and the coefficients are similar in magnitude.

5.5 Conclusion

This chapter explores the interactions among Chinese dual-listed stocks—A- and B-shares listed in the local Chinese markets, H-shares listed in Hong Kong markets, and N-shares listed in New York stock market—using the price behaviour of individual stock return indices. By exploring how dual-listed securities process information, the empirical causality tests show that information processing mutually occurred on both sides in Hong Kong and New York, and there is no leading party. For the Chinese shares dual-listed in local China market and overseas markets, the information flow exhibits a uni-directional feature and overseas markets has influential power over price changes. The study of the dual-listed China A- and B-share provides moderate evidence showing a bi-directional causal relationship. However, the Chinese local stock market is still maintained as a segmented market to the other markets such as Hong Kong and New York. There are some new findings, for example, that China A-share and B-share markets are becoming more integrated in terms of the price linkage between dual-listed A-shares and B-shares. Despite the share price disparity between these dual-listed securities, the price movements are affected by the location of trade where they trade. The dual-listed shares do have the error correction mechanism in most of the cases. In summary, although China is still segmented to other markets, with the reforms further taken by the Chinese authorities, the development of the Chinese market would continue in a stable and healthy manner.

An interesting and meaningful study about the relationship between Chinese dual-listed securities can be conducted in the future by studying the effect of short selling on the price changes of the dual-listed securities. However, since the Hong Kong and New York markets are free markets to an extent, and the dual-listed Chinese securities on these two markets are cointegrated and have very similar trends, which has been demonstrated in this chapter, it is still worthwhile to examine if there is an investment strategy that could be developed from the price discrepancy of the dual-listings. This is the subject of the following chapter.

Chapter 6: Cross-listing and Arbitrage

6.1 Introduction

The law of one price postulates that Chinese cross-border securities traded in Hong Kong and US in the form of ADRs are perfect substitutes, and that the price after exchange rate adjustments should be identical. When this law is violated, arbitrage opportunities exist which in turn ensures that the law of one price is upheld. The purpose of this chapter is to test whether arbitrage opportunities exists for Chinese securities traded in New York and Hong Kong, that is testing if the law of one price hold in this particular instance. Hong Kong and US are chosen because of the short selling potential which is not available in the Mainland China A and B markets. If the Hong Kong and US markets are integrated in terms of trading of cross-listed securities, the closing price in Hong Kong and the opening price in US for those cross-listings should not exhibit any exceptional levels of volatility, volume or spreads regarding the trading activity (Domowitz et al. 1998). However, the price disparity is readily observed for some of the dual-listed Chinese securities that are traded in both Hong Kong and New York markets. According to Malkiel (2007), H-shares and N-shares are reasonably priced relative to their growth rates, and yet the identical Chinese security traded in the local China A-share market is traded at a premium. The possible explanation to the identical Chinese securities sold at a premium in the local market but sold in the other market at a discount is called the reputational phenomenon (Cai 2007). Based on this phenomenon, issuers can piggyback on strong law enforcement and strong disclosure rules in these foreign jurisdictions, and sell their stocks in the home market at a premium (Cai 2007). One of the reasons for why arbitrageurs cannot profit from this mispricing is because of short selling restrictions.

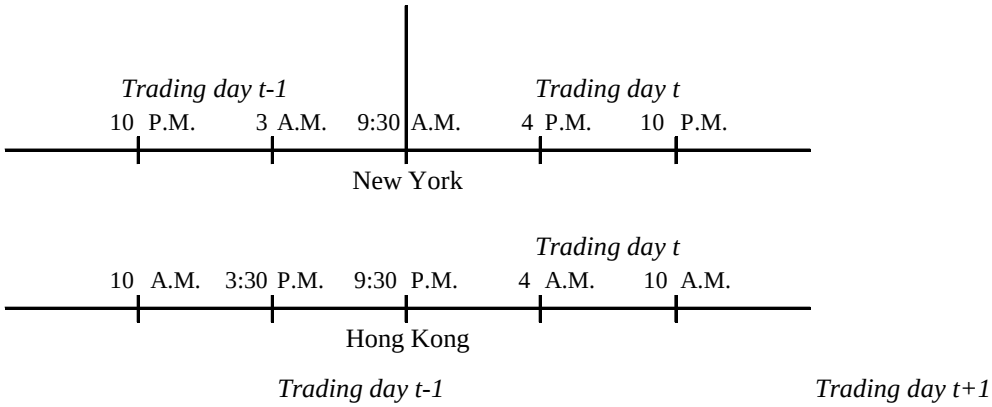
This chapter investigates the price disparity between these dual-listed or triple-listed Chinese securities and explores the arbitrage opportunities. Most of the dual-listed Chinese shares traded in the Hong Kong and New York markets also have their shares traded in the Mainland China market. As discussed above, since short selling is restricted in the Chinese mainland stock markets, the examination of the arbitrage opportunities focuses on the dual-listed Chinese securities that traded in Hong Kong and New York market in the form of ADRs. The empirical results suggest that arbitrage

opportunities do exist in these two markets before and after the consideration of transaction costs. This result is persistent after a number of robustness tests that includes executing the arbitrage strategy after a cut off rate, splitting the sample into two equal periods and controlling for autocorrelation. Although arbitrage opportunities exist for institutional investors, however, the non-trading time issue makes the arbitrage an uneasy task to execute. The rest of the chapter is organised as follows. Section 5.2 describes a Chinese ADR, Section 5.3 explains the data and methodology used and Section 5.4 discusses the empirical findings. The chapter conclusion is in section 5.5.

6.2 Chinese ADRs

6.2.1 Time Difference among Different Markets

Figure 6.1: Relative Timing of Trading Days on China (HK included) Stock Exchanges and New York Stock Exchange



Sources: Mak, Billy S. C. and Asta M.S. Ngai, Market Linkage for Dual-listed Chinese Stocks, The Chinese Economy 38(2), pp.96, 2005. The trading time information is double checked from the respective stock exchange website, and Figure 5.1 is still valid.

Figure 6.1 presents the timing of the trading day in two major markets in which Chinese companies are listed and traded in relation to the trading day on the Mainland China stock exchanges. The trading hours of the Hong Kong Stock Exchange are from 10:00 am to 3:30 pm with a two-hour (12:30–2:30 pm) lunch break. The trading hours of China's Stock Exchanges are 09:30–11:30 am, then 1:00–3:30 pm. The trading hours of the New York Stock Exchange are 9:30 am to 4:00 pm (North American East Time Zone). New York is 12 hours behind the Hong Kong market. In this case, the trading hours do not overlap.

6.2.2 ADR Settlement

To understand the ADR arbitrage operation requires an understanding of how to translate ADRs into underlying shares and *vice versa*. Since ADR represents a specific number of underlying shares kept aside in the home market, the depositary bank can create new receipts when the demand for the ADRs is greater than their supply. When the demand falls short of supply, the depositary bank can cancel ADRs by just simply reversing this process (Suarez, 2005).

Chinese ADRs are traded on US exchanges or in the OTC 'pink sheet' market and are quoted in US dollars. The holder of Chinese ADRs has the right to redeem the receipt for the underlying stocks. Transaction costs include bid-ask spreads and fees paid to the depositary bank for ADR creation and cancellation (Amary & Ottoni 2006). Therefore, when an ADR is trading at a discount to the underlying security, a trader can make arbitrage profits by buying the ADR, converting it into the underlying security, and then selling them in the underlying market. If the ADR is selling at a premium, a trader can buy the underlying security and then request the custodian bank to issue ADRs based on the underlying security. In absence of transactions costs and restrictions to capital flows, perfect cross-market arbitrage should equate the price of the two securities. Since the holders of ADRs can convert the ADRs into foreign currency-denominated underlying shares subject to cancellation and conversion fees, the investors can earn a risk-free profit if the price differential between the price of the ADR and the price in dollars of the underlying shares is sufficiently large to cover the transaction costs. Therefore, dealing with the ADR arbitrage, the creation and cancellation of ADRs must be considered, which might impede the arbitrage. The depositaries of the ADR would charge the brokers who trade across the US and the home market for their clients to obtain a better price, and charge to arbitrage traders trying to benefit from price differences.

The following example illustrates the steps involved in the creation and cancellation of ADR based on the illustrations from Gande's (1997) study and the ADR process explained on the website of New York Bank.

A US investor instructs his or her broker to buy 100 ADRs:

1. The broker has two options for executing this trade: a) purchase 100 existing ADRs in the US market; b) purchase 100 shares (it is assumed that the ADR ratio is 1:1 in this example) in the home market (Hong Kong in this case) and have new ADRs created. In this example, we assume that option b is the least-cost alternative.

2. The broker in US contacts the local broker in Hong Kong to purchase 100 shares of the issuer in the Hong Kong market.

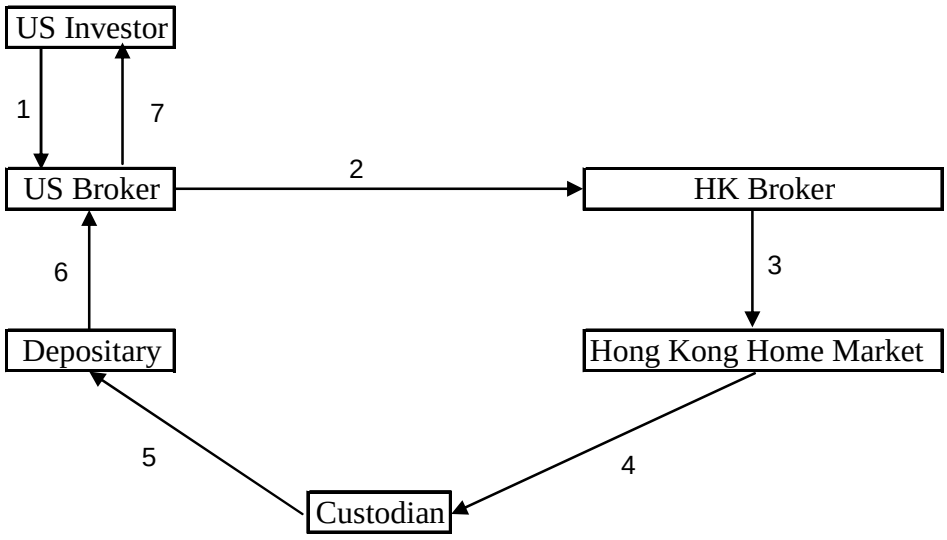
3. The local broker purchases issuer's shares in the home market.

4. The local broker deposits the shares with the depositary's custodian in the Hong Kong market.

5. The custodian notifies the depositary that it received the underlying shares for deposit and instructs the depositary to create 100 new ADRs and hand them to the investor's broker.

6. The depositary complies with the instructions and issues 100 new ADRs and delivers them to the investor's broker.

Figure 6.2: A US Investor Creates an ADR Process



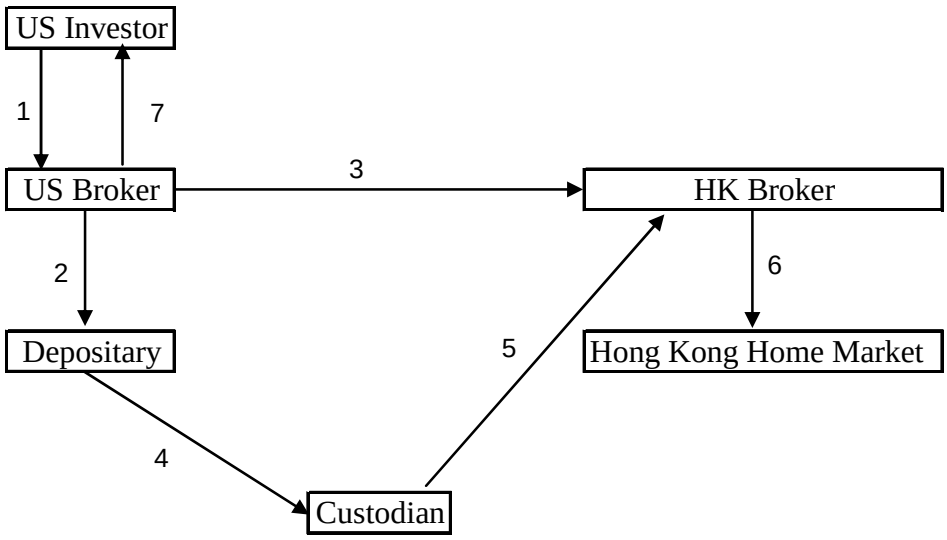
Sources: Gande, Amar, 1997, American Depositary Receipts: Overview and Literature Survey, Financial Markets, Institutions & Instruments 6(5). Bank of New York Website Mellon website, accessed 2008.

7. The broker credits the investor's account with 100 ADRs and deducts the investor's account for the dollar value of the transaction (including fees and brokerage commissions).

In contrast, the steps involved in the cancellation of an ADR follow the reverse direction. During the entire process, several transaction costs must be considered as well, which include: foreign brokerage fees; local brokerage fees; custodian charge for conversion (local and global); bank charges for transfer fees; and fund manager charges.

The cancellation of ADR is illustrated in Figure 6.3 as below:

Figure 6.3: A US Investor Cancels an ADR Process



Sources: Gande, Amar, 1997, American Depositary Receipts: Overview and Literature Survey, Financial Markets, Institutions & Instruments 6(5). And Bank of New York Website Mellon website, accessed 2008.

1. A US investor instructs his or her broker to sell 100 ADRs.

   The broker has too options for executing this trade: a) sell the ADRs in the US market; b) sell the underlying 100 shares (it is assumed that the ADR ratio is 1:1 in this example) in the home market (Hong Kong in this case) and have ADRs cancelled. In this example, it is assumed that option b is the highest value alternative.

2. The US broker delivers ADRs to the depositary for cancellation.

3. The US broker contacts a local broker in Hong Kong to sell 100 shares of the issuer in the Hong Kong market.

4. The depositary cancels the ADRs and instructs its custodian in the issuer's home market (HK) to release the underlying shares to the local broker.

5. The custodian complies with the instructions of the depositary.

6. The Hong Kong (Home) broker sells the underlying shares and remits the cash proceeds in dollar terms to the investor's broker.

7. The broker debits the investor's account with 100 ADRs and credits the investor's account for the dollar value of the transaction (net of fees and brokerage commissions).

6.2.3 Chinese ADRs and Arbitrage

A cross-listed Chinese company involves one company issuing identical but differently labelled shares that are traded in different markets. Theoretically, in integrated and efficient financial markets, stock prices of the identical securities should move in lockstep (De Jong 2009). It can be observed that the prices of Chinese shares listed in Hong Kong are different from their ADRs listed in the US. Several reasons might cause this price discrepancy. The time difference between trading hours in Hong Kong and US might cause different valuation of the shares (Hsu & Wang 2008). Market news and sentiments might be other factors that are responsible for the phenomenon of price discrepancy. The price differences between different markets provide potential arbitrage activity (Han 2004).

If there is no time issue, Chinese ADRs traded during Hong Kong market hours offering a live arbitrage opportunity offers very little risk in such trading and the gap between the ADRs and underlying stock is minimal (Hsu & Wang 2008). When share prices exhibit large deviation from theoretical parity, an arbitrage position could be then set up by obtaining a long position in the relatively underpriced shares and a short position in the relatively overpriced shares. However, this strategy may be difficult to execute between Chinese markets and foreign markets because of the extremely limited foreign access to mainland shares and limited local access to shares listed internationally. Thus, a foreigner holds a share of Sinopec, for example, that is trading at a 25 per cent

premium in Shanghai, could not explore the arbitrage profit from short sale in Shanghai while buying them in Hong Kong or New York; because she/he is not allowed to do so according to the trading policies (short selling restriction) regulated by the Chinese authorities.

While Chinese ADRs are listed and traded in the New York market, their underlying securities are traded in the Hong Kong market to provide another opportunity for arbitrageurs. Since ADRs are exchangeable into the underlying security and should have the same value; practically, if there is a spread between the perceived values in the two markets, arbitrage can be extracted. If the ADR is trading at a value lower than what the underlying share is in the other market, one can purchase the ADR and expect to make money as its value converges, and *vice versa*.

6.3 Data and Methods

6.3.1 Data and Methods

One way of addressing the time difference between Hong Kong and New York is to follow Lau and Diltz's (1994) methodology whereby the closing price of each listing in Hong Kong and the opening price of each listing in New York are recorded for analysis. The second adjustment will be to convert both prices into a common currency. For the price comparison or price disparity examination, all the New York stock prices are adjusted for exchange rates and are converted into the Hong Kong dollar equivalent. Further adjustment for the ratio of the ADR is considered. All the data used for analysis, including the opening, closing prices, foreign exchange rate are obtained from Datastream from the 1st of January 1993 to 31st of December 2008. In Chapter Four, 77 dual listed firms were identified in China A and China B market and 33 in China A and Hong Kong market. There were 11 companies that were triple listed and three more companies that were dually traded on China A, Hong Kong and New York. As there are short selling restrictions between the two Chinese markets, there is no practical reason to conduct the strategy for the Chinese market and Hong Kong market. Consequently we are left with only the later 14 companies.

Table 6.1 depicts the summary descriptive statistics of the daily price disparity returns for all the 14 Chinese dual-listed securities that are traded in both Hong Kong and New York. The table shows that Chinese ADRs take a relatively higher premium up to 32.14

per cent (see the maximum value for China Easter) and discount down to -18.83 per cent (see the minimum value for Yanzhou) during the examined period. These entire 14 price premium series exhibit a low dispersion level with modest standard deviation of one per cent to two point five per cent; that is, most of the price disparity return series are near their mean value. The excess kurtosis for some of the price disparity series are high, suggesting that there could be some extreme observations that lie at the tail of the distribution. These extreme observations could be seen as potential arbitrage opportunities. The positive or negative skewness may suggest that these extreme observations could be either price premium or price discount. The exceptional case is China Eastern, the data reflects a relative higher standard deviation of 2.7 per cent, wider price premium range of 48.48 per cent, and larger excess kurtosis. Overall, the relative low standard deviation may imply that the significant premiums or discounts could not have existed for long as arbitrageurs close the gap immediately when the high price difference is observed.

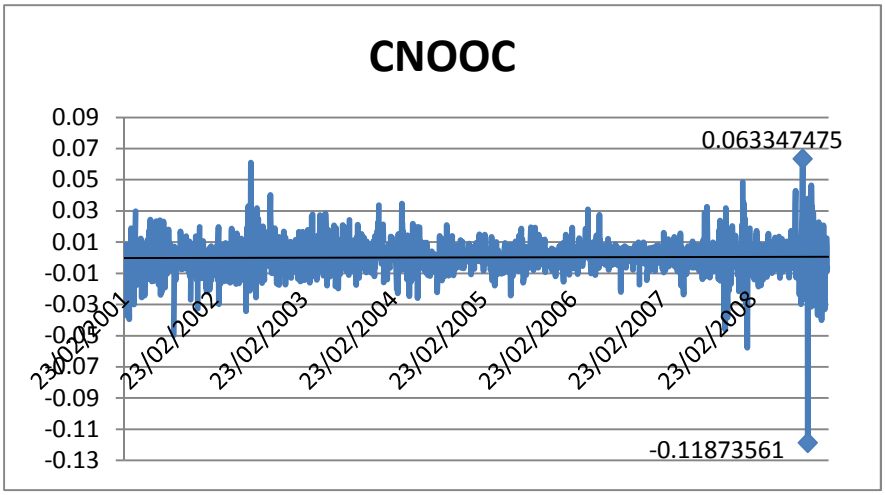
Table 6.1: Descriptive Statistics of Daily Price Disparity Returns for 14 Dual-listings in Hong Kong and New York

	Mean	Std. Deviation	Skewness	Kurtosis	Minimum	Maximum	Range	Observations
Aluminum	0.0001	0.0260	0.1106	2.8554	-0.1234	0.1634	0.2868	1679
Chinaeaster	0.0001	0.0270	1.1249	10.4086	-0.1634	0.3214	0.4848	2796
Chinalife	-0.0008	0.0113	0.2939	3.6525	-0.0510	0.0653	0.1163	1267
Chinamobile	0.0007	0.0118	0.1113	9.9318	-0.0772	0.1075	0.1847	2813
Chinapetro	-0.0011	0.0118	-0.1201	2.9374	-0.0739	0.0555	0.1294	2057
Chinasouthern	-0.0016	0.0256	1.1581	9.1615	-0.1226	0.2335	0.3561	2830
Chinatelcom	-0.0010	0.0104	-0.4550	8.4671	-0.0941	0.0593	0.1534	1537
Chinaunicom	-0.0006	0.0128	-0.1793	5.2126	-0.0992	0.0731	0.1723	2139
CNOOC	0.0001	0.0105	-0.5695	11.5329	-0.1187	0.0633	0.1821	1969
Guangshen	-0.0002	0.0220	0.3080	2.8880	-0.1146	0.1677	0.2823	3170
Huaneng	-0.0020	0.0190	-0.6823	6.3690	-0.1347	0.0942	0.2289	2755
Petrochina	0.0002	0.0108	-0.3881	3.9388	-0.0689	0.0466	0.1155	2194
Sinopec	-0.0003	0.0213	0.6576	5.3696	-0.1142	0.1592	0.2734	3855
Yanzhou	0.0012	0.0251	0.7141	9.7541	-0.1883	0.2000	0.3884	2516

For a better visual observation of the price disparity returns, Figure 6.4 shows the daily price disparity return for CNOOC as a representative example. Appendix 8 presents the other 13 price disparity returns charts. Figure 5.4 shows that most of the price disparity returns fall in the (-0.01, +0.01) range. Some of the larger numbers are also recorded. For example, the minimum price discount of 0.1187 is occurred on 7th October 2008, and the maximum price premium of 0.063 is occurred on 16th September 2008.

Figure 6.4: CNOOC Price Disparity Returns

Figure 6.4 shows the price disparity returns from theoretical parity for CNOOC during the period of 23 February 2001 to 31 December 2008 with total 1969 observations.



6.3.2 Methodology Used to Back Test for the Price Disparity Trading Strategy

To test Hypothesis 8, a simple trading strategy is established as follow, which involves buy low and sell high, more specifically short sell high. On days when the closing Hong Kong market prices are higher than the opening prices in the New York market, the strategy will buy the stock in the New York market and will sell the company in the Hong Kong market. This will give rise to the following return:

$$R_{it}^{PD} \left| \left(cp_{it}^{HK} > \frac{op_{it}^{NY} \times e_t}{ratio_i} \right) = \left(\frac{cp_{it}^{HK} - \left[\frac{op_{it}^{NY} \times e_t}{ratio_i} \right]}{\frac{op_{it}^{NY} \times e_t}{ratio_i}} \right) \right. \quad (6.1)$$

Where R_{it}^{PD} is the price disparity return for stock *i* at time *t*

cp_{it}^{HK} is the closing price in Hong Kong of stock *i* at time *t*.

op_{it}^{NY} is the opening price in New York of stock *i* at time *t*.

e_t is the exchange rate of US dollar to Hong Kong dollar

$ratio_i$ is the number of shares in one ADR for company *i*

Conversely, on days when the New York opening prices are higher than the closing price in the Hong Kong market, an arbitrage strategy would entail buying on the Hong Kong and selling in New York market. Equation 5.1 will change to the following:

$$R_{it}^{PD} \mid \left(cp_{it}^{HK} < \frac{op_{it}^{NY} \times e_t}{ratio_i} \right) = \left(\frac{\left[\frac{op_{it}^{NY} \times e_t}{ratio_i} \right] - cp_{it}^{HK}}{cp_{it}^{HK}} \right) \quad (6.2)$$

Hence the profitability of the strategy is given by either of these two equations on a given day and can be written as follows:

$$R_{it}^{PD} = \left| \frac{\left[\frac{op_{it}^{NY} \times e_t}{ratio_i} \right] - cp_{it}^{HK}}{cp_{it}^{HK}} \right| \quad (6.3)$$

Using the daily returns generated from equation (5.3), the average daily price disparity($\overline{R_{it}^{PD}}$) return for each of the 14 companies are calculated as shown below:

$$\overline{R_{it}^{PD}} = \frac{\sum_{t=1}^{n} \left| \frac{\left[\frac{op_{it}^{NY} \times e_t}{ratio_i} \right] - cp_{it}^{HK}}{cp_{it}^{HK}} \right|}{n} \quad (6.4)$$

Where *n* is the number of observations.

According to Fama (1976) daily and monthly returns are not normal. To that end instead of using discrete returns as shown in the first four equations, the logarithmic returns are used. Equation 5.3 is thus converted into:

$$LR_{it}^{PD} = LN \left| \frac{\left[\frac{op_{it}^{NY} \times e_t}{ratio_i} \right]}{cp_{it}^{HK}} \right| \quad (6.5)$$

To examine arbitrage possibilities, transaction costs are one of the important factors to influence the arbitrage decision. These transaction costs create a no-arbitrage band, therefore, the arbitrage opportunity must be sizeable enough to generate a profit that could cover and exceed the costs involved. Not all the misprised securities have the profitable arbitrage opportunities. This study examines whether arbitrage opportunities exist for Chinese based stocks traded in the New York market as ADR and the Hong Kong market when transaction costs are considered. The transaction costs structure

faced by each category of investors is significantly different from each other. These differences can affect the magnitude of profits that they can reap from arbitraging. The transaction costs to an investor can consist of several elements, including ADR conversion fee, brokerage fees, clearing fees, stamp duty, and foreign exchange cost. Investors pay a transaction cost of 0.23 per cent in Hong Kong (c_{HK}) and 0.26 per cent in New York (c_{NY}). The total transaction cost (c) used in this study is a combination of these two costs and amounts to approximately 0.5 per cent. Table 6.2 presents a list of the related transaction costs when buying or selling the Chinese ADRs and their underlying securities in two markets.

Table 6.2: Computation of Transaction Costs

When the transaction is initiated in HK	
ADR conversion fee	US$0.05 per ADR
Stamp duty on stock transaction	0.10%
Foreign exchange rate fee	0.01%
Brokerage fee at NY market	0.10%
CCASS fee	0.01%
Custody fee	Free

When the transaction is initiated in NY	
ADR conversion fee	US$0.05 per ADR
Foreign exchange rate fee	0.01%
Brokerage fee at HK market	0.25%
Custody fee	Free

Sources: transaction costs information is obtained from Guoyuan Securities Brokerage (Hong Kong) Limited 2008.

Consistent with Ding (2000), the returns identified in the above equations are not adjusted for risk and thus shows the dollar amount of profit that can be earned from this strategy. In an effort to calculate the actual return realised by investors, there is a need to consider transaction costs. Following Ding (2000), the profitability of the strategy after the transaction costs (c) and are re-written as follows:

$$LR_{it}^{PD} = LN\left|\frac{\left[\frac{op_{it}^{NY}\times e_t}{ratio_i}\right]}{cp_{it}^{HK}}\right| - c \qquad (6.6)$$

It is expected that financial institutions have much lower transactions costs than an ordinary trader. In studying the arbitrage opportunities with transaction costs, this

examination focuses on one typical type of investors that are likely to be involved in arbitrage activities. This type of investors could be institutional investors such as stockbroking houses, banks and QFII.

The implication of a 0.5% transaction cost is that traders will not execute this trading strategy when they observe that the profit is below 0.5%. This gives rise to another scenario analysis whereby the arbitrageur will only execute this strategy when the following condition holds

$$LR_{it}^{PD} = LN\left|\frac{\left[\frac{op_{it}^{NY}\times e_t}{ratio_i}\right]}{cp_{it}^{HK}}\right| > 0.5\% \tag{6.7}$$

The returns used so far are not adjusted for risk. CAPM is used to calculate the risk adjusted returns. One of the challenge was to decide which country's return was to be adopted. Given that all the returns are converted into Hong Kong dollar equivalent, the returns from Hong Kong were employed and this gave rise to the following model.

$$R_{it}^{HK} = rf_t^{HK} + \beta_i^{HK}(R_{Mt}^{HK} - rf_t^{HK}) \tag{6.8}$$

Where

R_{it}^{HK} is the asset *i* (the underlying asset of ADRs traded in Hong Kong) return in Hong Kong market at time *t*.

rf_t^{HK} is the risk free rate in Hong Kong, here is the prime rate in Hong Kong market.

β_i^{HK} is the beta of the company showing the sensitivity of the asset *i*'s returns to market returns at time *t*.

R_{Mt}^{HK} is Hong Kong market returns at time *t*.

The daily price disparity returns are adjusted accordingly. For instance the risk adjusted after transaction cost return is given by

$$LR_{it}^{PD} = \left[LN\left|\frac{\left[\frac{op_{it}^{NY}\times e_t}{ratio_i}\right]}{cp_{it}^{HK}}\right| - c\right] - [rf_t^{HK} + \beta_i^{HK}(R_{Mt}^{HK} - rf_t^{HK})] \tag{6.9}$$

Jegadeesh (1990) and Lehman (1990) point out that arbitrage strategies like momentum and contrarian may contain biases, like bid-ask bounce, price pressure and lagged

reactions. The solution proposed by Jegadeesh and Titman (1993) was to skip one period between the formation period and the holding period and checked for robustness by splitting the data set into two sub-periods. If these measures are not controlled for, it will lead to autocorrelation which in turn distorts the mean and the t-statistics. The first approach of skipping one period between the formation and holding period is inadequate as this strategy is to execute in a one period environment. The other two measures are undertaken.

To control for autocorrelation, the methodology of Ramiah et al (2010) is used:

$$LR_{it}^{PD} = \alpha_0 + \beta_1 LR_{t-ml}^{PD} + \varepsilon_t \quad (6.10)$$

Where the dependent variable is the daily logarithmic price disparity return for stock *i* at time *t. ml* stands for the major lagged factor, α_0 represents the unbiased mean return of the portfolio and β_1 represents the autocorrelation coefficient. Equation 10 controls for the major autocorrelation factor but does not control for other lags; consequently, we apply the Newey-West test, which allows us to generate more reliable means, standard errors and t-statistics.

6.4 Empirical Results

Table 6.3 provides detailed individual company's daily return and overall returns of the trading strategy before transaction costs are considered. Before considering transaction cost, the profits is recorded for all of the companies. The maximum daily average return is 1.95 per cent which occurred for the company of China Easter, the minimum daily return is 0.73 per cent for the company of China Telcom. The higher return implies that the prices between the Chinese ADR and its underlying asset diverge considerably. The overall average daily return for these 14 companies is 1.3 per cent. The standard deviation is low, which suggests that the daily return is clustered to the mean return.

The larger t-statistics show that all of the daily returns are statistically significant. In summary, the price disparity trading strategy works in this case. Further, the beta for each company is displayed in table 6.3. The individual beta and the portfolio beta are smaller than 1, implying that the assets are less risky when compared to the market risk.

Table 6.3: The Actual Price Disparity Returns

This table presents average daily price disparity returns for the time period from 1st January 1993 to 31st December 2008, where transaction costs are ignored. Standard deviation, t-statistics, beta (return sensitivity to market) and total observations are reported.

	Before transaction costs				
	Mean	**Std. Deviation**	**T-statistics**	**Counts**	**Beta**
Aluminum	1.88%	0.0180	42.7706	1679	0.358
Chinaeaster	1.95%	0.0187	55.1501	2796	0.440
Chinalife	0.82%	0.0078	37.7641	1267	0.766
Chinamobile	0.80%	0.0086	49.4859	2813	0.859
Chinapetro	0.86%	0.0081	47.8080	2057	0.667
Chinasouthern	1.84%	0.0179	54.8449	2830	0.453
Chinatelcom	0.73%	0.0074	38.9755	1537	0.731
Chinaunicom	0.95%	0.0087	50.4770	2139	0.754
CNOOC	0.73%	0.0076	42.3817	1969	0.659
Guangshen	1.65%	0.0146	63.5548	3170	0.433
Huaneng	1.30%	0.0140	48.8671	2755	0.437
Petrochina	0.76%	0.0076	46.9535	2194	0.633
Sinopec	1.52%	0.0150	62.9840	3855	0.400
Yanzhou	1.55%	0.0199	39.0309	2516	0.495
Overall	1.30%	0.0145	164.3448	33577	0.270

Table 6.4: The Price Disparity Returns when Transaction Costs Considered

This table presents average daily price disparity returns for the time period from 1st January 1993 to 31st December 2008 when transaction costs are considered. Standard deviation, t-statistics and total observations are reported.

	After transaction costs			
	Mean	Std. Deviation	T-statistics	Counts
Aluminum	1.38%	0.0180	31.3697	1679
Chinaeaster	1.45%	0.0187	40.9757	2796
Chinalife	0.32%	0.0078	14.8019	1267
Chinamobile	0.31%	0.0086	18.7488	2813
Chinapetro	0.36%	0.0081	19.9408	2057
Chinasouthern	1.34%	0.0179	39.9730	2830
Chinatelcom	0.23%	0.0074	12.4257	1537
Chinaunicom	0.45%	0.0087	23.7683	2139
CNOOC	0.23%	0.0076	13.1716	1969
Guangshen	1.15%	0.0146	44.2755	3170
Huaneng	0.80%	0.0140	30.1148	2755
Petrochina	0.26%	0.0076	16.1997	2194
Sinopec	1.02%	0.0150	42.2342	3855
Yanzhou	1.05%	0.0199	26.3996	2516
Overall	0.80%	0.0145	101.1831	33577

The empirical results (see Table 6.3) are the daily returns when transaction costs are not considered. Table 6.4 reports the empirical results when transaction costs are considered. When transaction costs are incorporated into the analysis, the strategy is still profitable. The overall average daily return for these 14 companies decreases from 1.3 percent to 0.80 percent. For individual company and the average daily returns decreased by a constant amount of 0.5 per cent which is just by the amount of the transaction cost. Although the daily arbitrage profits vary from 0.23 per cent to 1.45 per cent, the larger t-statistics suggesting the returns are still statistically significant.

Table 6.5: The Price Disparity Returns when Profit is Greater than Transaction Cost

This table presents average daily price disparity returns for the time period from 1st January 1993 to 31st December 2008 when arbitrageurs execute the trading strategy when the profit is greater than 0.005. Standard deviation, t-statistics and total observations are reported. The days of arbitrage and the frequency of arbitrage are recorded as well.

	Execute when profit>0.005 and market return risk controlled					
	Mean	**Std. Deviation**	**T-statistics**	**Days of Arbitrage**	**Total Counts**	**Frequency of Arbitrage**
Aluminum	1.78%	0.0200	32.5014	1329	1681	79.06%
Chinaeaster	1.79%	0.0187	46.5951	2309	2798	82.52%
Chinalife	0.71%	0.0078	25.5896	741	1269	58.39%
Chinamobile	0.73%	0.0092	32.1618	1583	2815	56.23%
Chinapetro	0.76%	0.0081	33.6955	1230	2059	59.74%
Chinasouthern	1.75%	0.0178	47.0633	2237	2832	78.99%
Chinatelcom	0.65%	0.0079	24.9020	818	1539	53.15%
Chinaunicom	0.80%	0.0086	35.3934	1394	2141	65.11%
CNOOC	0.65%	0.0080	26.9665	1055	1971	53.53%
Guangshen	1.49%	0.0143	53.1424	2517	3172	79.35%
Huaneng	1.28%	0.0140	48.8671	2755	2757	99.93%
Petrochina	0.70%	0.0079	31.9381	1175	2196	53.51%
Sinopec	1.39%	0.0151	51.1345	2942	3857	76.28%
Yanzhou	1.67%	0.0216	32.4478	1685	2518	66.92%
Overall	1.28%	0.0153	129.0722	23770	33605	70.73%

Rational arbitrageurs will not engage in any arbitrage opportunity if the benefits are lower than the cost. In this particular instance, it is assumed that arbitrageurs will only execute this trading strategy if the potential profit is higher than 0.5%. When both of the transaction costs and market risk sensitivity analysis are considered, the empirical results shown in Table 6.5 demonstrate that this simple trading strategy continues to work. Table 6.5 shows that the greatest frequency of profitable arbitrage, after transaction costs, occurs for Huaneng with arbitrage opportunities present for 99.93 per cent of the trading days. Even the least profitable arbitrage stock, such as China Telcom,

reveals an arbitrage opportunities for 53.15 per cent of the trading days. Overall, the arbitrage trading is possible for 70.73 per cent of the time in the whole sample. The average return for all of the 14 cross-listings is 1.28 per cent daily. For each company, statistically significant daily return from 0.65 per cent to 1.79 per cent after transaction costs are recorded and market risk is incorporated. Standard deviation is still low which suggesting the daily return is close to the mean value.

Table 6.6: Robustness Test for the Price Disparity Strategy

This table presents average daily price disparity returns for the time period from 1st January 1993 to 31st December 2008. Mean return and the t-statistics are reported. These daily returns are adjusted for autocorrelation. Robustness test in terms of splitting the sample into two equal samples is conducted, which is coded as sub period 1 and sub period 2.

	A		B		C		D	
	After transaction costs		**Execute when profit>0.005 and market risk controlled**		**Sub period 1**		**Sub period 2**	
	Mean	T-statistics	Mean	T-statistics	Mean	T-statistics	Mean	T-statistics
Aluminum	1.09%	18.2521	1.52%	16.5027	1.65%	14.6602	1.47%	11.1738
Chinaeaster	0.95%	20.0107	1.19%	18.1601	1.48%	14.9070	0.98%	12.1996
Chinalife	0.24%	10.3626	0.53%	11.1132	0.59%	12.1534	0.53%	8.2673
Chinamobile	0.22%	13.4001	0.53%	13.0424	0.60%	10.0012	0.47%	8.7546
Chinapetro	0.27%	12.2113	0.70%	17.8679	0.82%	14.3446	0.55%	11.0728
Chinasouthern	0.82%	10.5145	1.07%	8.4980	1.34%	6.4921	0.92%	12.7950
Chinatelcom	0.19%	7.3802	0.64%	11.7220	0.43%	9.2788	0.79%	9.2156
Chinaunicom	0.35%	15.4400	0.69%	15.9238	0.77%	15.7602	0.60%	7.8545
CNOOC	0.17%	8.5523	0.53%	12.6201	0.56%	10.4001	0.52%	6.5865
Guangshen	0.77%	19.2715	1.06%	19.3452	1.33%	18.0065	0.97%	16.6117
Huaneng	0.45%	11.9742	0.73%	12.7933	0.94%	10.2929	0.68%	16.0927
Petrochina	0.20%	10.2860	0.58%	12.6069	0.66%	10.4807	0.48%	7.1502
Sinopec	0.65%	15.1283	0.93%	12.5504	1.11%	9.9469	0.81%	12.5443
Yanzhou	0.43%	9.1507	0.86%	8.6039	1.24%	7.6303	0.77%	11.3046
Overall	0.40%	12.24046	0.55%	11.6302	0.63%	11.1820	0.57%	12.8047

In addition, two tests on the robustness of the trading profitability are performed. The first controls for autocorrelation and therefore generates a new mean return and t-statistics. The second robustness test is performed by sub-period analyses by splitting the whole sample period into two equal sub-periods. The empirical results are shown in Table 6.6. For example, the sample period for company Petro China ranged from July 1993 to December 2008; October 2000 would be the break point. Section A and section B from Table 6.6 report the first robustness test results. Section C and D report the second robustness test results. Overall, the returns are reduced but still statistically significant, and the t-values are improved greatly. For instance, the average daily raw returns for company Yanzhou drops significantly from 1.47 per cent (see Table 6.5) to only 0.86 per cent (see Section B in Table 5.6). And both sub-periods show statistically significant trading profits with the highest profits of 1.65 per cent and 0.84 per cent (see Section C and D in Table 6.6). In summary, the empirical findings show that the price disparity strategy still generate positive returns, and Hypothesis 8 is not rejected.

6.5 Conclusion

The objective of this study was to test if the law of one price holds between the dual-listed Chinese shares traded in Hong Kong and New York. Using a simple testing mechanism, this chapter shows that that arbitrage profits do exist. The mere existence of such profits implies a violation of the law of one price and as a result, it is fair to conclude that there is price disparity for dual listed stocks, in particular Chinese firms listed in both New York and Hong Kong. On average an arbitrageur can earn an *ex-post* daily return up to 1.79 per cent after transaction costs by investing in only one company. A portfolio of 14 dual listed stocks earns an average daily return of 1.28 per cent over the period studied. After a number of robustness test, this strategy continues to be profitable. Informal discussions with traders in Hong Kong reveal that such a strategy is in place. At this point, it might be asked why there are so many profitable disequilibria appeared in such two developed Hong Kong and US markets. The possible explanation is the non-overlapping trading time. The overnight risk makes the arbitrage hard. But when the price disparity becomes greater, it is found that the large price difference gap would be arbitraged away immediately. So the price disparity returns are a puzzle.

Chapter 7: Micro-analysis of the Bank of China

7.1 Overview

The globalization of financial markets has been accelerated in the past two decades. As more and more Chinese firms have the opportunities to benefit from fund raising, increased shareholder base, international reputation and prestige by cross-listing, a significant slowdown in the international cross-listing and trading activity has occurred in the past 10 years (Karolyi, 2006). Some of the attributing factors for this trend include corporate governance issues, information asymmetries, and liquidity issues when shares are traded in multiple markets (Karolyi, 2006). To demonstrate a more complete picture of Chinese cross-listing, the Bank of China (hereafter the Bank) has been chosen as a case to study the implications of the findings so far in this thesis.

7.2 Analysis

7.2.1 Bank of China Background

As the oldest bank and one of four largest banks in China, Bank of China was founded in 1912. By amounting assets of approximately RMB 69 trillion, operating a network consisting of 12,000 branches and offices in 26 countries and nearly 200,000 employees, the Bank is ranked 10th among the world's top 1,000 banks by The Banker magazine in 2008[2].

After founding of the People's Republic of China, with a long history in acting as the state-designated specialist foreign exchange bank, Bank of China became China's important window to the world and the key foreign exchange financing channel. Transformed from a specialist foreign exchange bank into a state-owned commercial bank in 1994, Bank of China began a joint stock restructuring in 2003, which resulted in Bank of China Limited being incorporated in August 2004 and listed on the Hong Kong Stock Exchange and the Shanghai Stock Exchange in June and July 2006 respectively, becoming the first Chinese commercial bank listed in domestic and overseas capital markets (Bank of China Annual Report, 2008).

[2] Numbers are extracted from the Bank of China's Annual Report 2008.

7.2.2 Corporate Governance of Bank of China

Since the restructure of Bank in 2003, in compliance with the (People's Republic of China) PRC Company Law, PRC Commercial Banking Law and regulatory requirements promulgated by regulatory authorities and based on its actual experience, the Bank promoted sound corporate governance and the improvement of its corporate governance framework as a modern joint-stock company, which is composed of the Shareholders' Meeting, the Board of Directors, the Board of Supervisors, and the Audit Committee, and Senior Management. The posts of the Chairman and the President are assumed by two persons, to avoid undue concentration of power. By following the responsibilities set forth in the Articles, all parties functioned independently in compliance with the relevant laws and exercised their rights and obligations respectively.

In 2006, after the Bank listed its shares in the Hong Kong market, the Bank adopted measures to enable it to observe the Code on Corporate Governance Practices (the Code) as set out in Appendix 14 of the Hong Kong Listing Rules. The Bank has complied with the Code provisions and most of the recommended best practices set out in the Code. The Bank also observes the laws and regulations, as well as the various provisions and guidelines, of the local regulatory authorities where it has business operations. Price Waterhouse Coopers becomes the independent auditor for the Bank. Followed by the Code, the Bank of China also adopts the international accounting standards, and having Hong Kong directors' presence.

7.2.3 Company Valuation

In Chapter 4, Tobin's *q* has been used as the proxy for firm's valuation, served as a dependent variable when exploring the relationship between firm valuations with corporate governance mechanisms. The empirical results presented in Chapter 4 revealed that the non-cross-listed Chinese firms have a better firm performance than those cross-listed. Supposedly effective corporate governance mechanisms, such as international accounting standards, independent director system, supervisor system, separation of CEO and Chairperson, and the board size, have little effect in improving firm's valuation. In this section, the valuation of Bank of China provides additional specific information to the discussion present in Chapter 4. Table 7.1 reports the firm

valuation of the Bank of China from year 2006 to year 2008 comparing with the mean firm valuation of the non-cross-listed Chinese firms during the same period.

Table 7.1: Tobin's *q* Comparison

	2006	2007	2008
China A Non-cross-listing	1.886	3.628	1.736
Bank of China	1.133	1.080	1.001

By looking at these numbers shown in Table 7.1, the valuation of the Bank of China is a far from satisfactory in comparison to the non-cross-listed domestic companies with a lower Tobin's *q* value around 1. The null hypothesis of cross-listing associated with increased firm valuation is rejected in this simple case. Although, one single company could not draw the whole cross-listing picture, this single case should shed light on the corporate governance issue for both of the non-cross-listed and cross-listed Chinese firms.

It is well known that progress in the capital market and in the area of corporate governance has been slower in China than in several other East Asian countries (Solomon et al. 2004). However, during the last two decades, China has kept moving toward a more liberal market system and a more transparent and developed corporate governance system. For example, more and more listed Chinese firms are not chiefly owned by the Government. The ownership reforms have initiated extensive privatization of the SOEs, creating a separation between company management and Government. However, institutional effects and the long term corporate culture in China cannot be changed overnight to achieve a satisfactory corporate governance framework. Although the Bank of China adopts more stringent financial disclosures, following the listing rules regulated by the Stock Exchange of Hong Kong and other market in terms of corporate governance, the real reform involves a long and difficult process that takes many years, even when the systems and structures are in place.

7.2.4 Return Analysis of the Bank of China

Table 7.2 reports the summary statistics of the daily return series for the Bank of China that traded in both the China A and Hong Kong market from 1st of June 2006 to 31st December 2008. The daily return of this dual-listing has the same trend but with a

different magnitude. The Hong Kong market recorded the highest daily return for the Bank of China with 20.06 per cent, while China A market has a maximum daily return of 9.68 per cent. The standard deviation for the two return series is around 2.5 per cent on average. The positive skew indicates many positive numbers. Overall, the return series for the Bank of China in two markets exhibits a similar characteristic of the statistical description but with different magnitude.

Table 7.2: Descriptive Statistics on Returns of the Bank of China A and Hong Kong Markets for the Period 01/06/2006 to 31/12/2008

	Bank of China	
	China A market	**Hong Kong Market**
Mean	-0.0003	-0.0006
Maximum	0.0968	0.2006
Minimum	-0.1048	-0.1616
Std. Dev.	0.0243	0.0267
Skewness	0.2855	0.6506
Kurtosis	6.4011	13.3429
Jarque-Bera	322.1244	3051.778
Observations	650	674

To compare the mean returns and variance for the Bank of China dual-listed in China A and Hong Kong markets, paired T-test and F-distribution were used. Table 7.3 reports the test statistics of equal means and variances for the Bank of China's return data during the period of 2006 to 2008. First, this pair shows a lower correlation relationship with (r = 0.3891). The higher t-statistic value indicates that this pair has the same return for the period studied. The F-distribution also indicates that the return variance is similar in these two markets for the Bank of China's share.

Table 7.3: Paired Comparison of Daily Stock Returns for the Bank of China Dual-listed in China A and Hong Kong Markets

Bank of China Paired T-Test	
Paired Correlation	0.3891
Paried Difference	
Mean	0.0004
Standard deviation	0.0284
T-statistic	0.3625
P-value	0.7171
F-distribution	
F-value	0.8064
P-value	0.0062

7.2.5 Price Difference of the Bank of China

Table 7.4 depicts the descriptive statistics of the daily price disparity returns for the Bank of China that is traded in both Hong Kong and the China A markets. The table shows that the Bank of China traded in China A market takes a relatively higher premium up to 63.53 per cent and discount down to 12.16 per cent during the examined period, along with a high standard deviation of 17.65 per cent. This extreme value suggests possible arbitrage opportunities by trading the share in China A and the Hong Kong market. However, due to short selling and capital control restrictions, arbitrage in these two markets is impossible. The examination of the price disparity for the Bank of China also supports the idea that the China A market is still segmented from the Hong Kong market.

Table 7.4: Descriptive Statistics of Daily Price Disparity Returns for the Bank of China during the Period 01/06/2006 to 31/12/2008

Bank of China Price Disparity Return	
Mean	0.2136
Standard Deviation	0.1765
Minimum	-0.1216
Maximum	0.6353
Kurtosis	-1.1922
Skewness	0.1075
Range	0.7569
Observation	650

7.2.6 Market Co-movement and Cointegration Analysis

The empirical study of the market co-movement extracted from Chapter 5 reveals that the share prices of the Bank of China traded in both the China A and the Hong Kong markets are affected by the location, which supports the market segment hypothesis. The cointegration analysis of the Bank of China indicates that there is no long run cointegrated relationship between these two return series, which also supports the market segment hypothesis.

7.3 Conclusion

The examination of the Bank of China that dual-listed in the China A and the Hong Kong markets supports the empirical findings in this thesis from a micro-dimension. From the point view of corporate governance, the Bank of China appears to be following all of the rules and regulations set up by the markets where it is traded. The reason of the lower firm valuation proxies by Tobin's *q* could be contributed to different factors. Clearly it sends out one message that cross-listing doesn't guarantee higher firm valuation or performance. In addition to this, the finding also extends the arguments of previous studies on the segmented China A-share and the Hong Kong market in terms of the cross-listing. One interesting issue derived from the findings is that cross-listed Chinese stocks, with the same underlying stocks, have constantly shown long-run separated prices in different markets. Furthermore, short selling restrictions, strict foreign exchange controls, trading restrictions and the changing regulations governing

the Chinese financial markets are all possible factors that may deter arbitrage and long run cointegration from happening.

Chapter 8: Conclusion, Limitations and Future Research

This chapter summarises the major research findings of this study based on the empirical test results in the previous chapters. The contributions and limitations of this research are also addressed, and several directions for future research are proposed.

8.1 Conclusion

During the last two decades, the Chinese stock markets have been undergoing a significant amount of change, including changes in rules, regulations and trading policies. For example, CSRC recently announced that the short selling of stocks and market index future contracts would be launched soon and made on a trial basis by a small number of brokerage firms (Yi 2010). These changes are expected to develop a more improved market, and strengthen the market's finance function in China.

8.1.1 Conclusion of the First Empirical Study

The purpose of this study was to examine Chinese cross-listing from different angles. It is commonly believed that, as an emerging economy, China lacks a well-developed financial and money market, and its legal system is often labelled as weak. It is also commonly believed that the corporate governance mechanisms for investor protection and shareholder rights in the US are the benchmark for others. However, the Enron and WorldCom debacles have shaken the superiority of US investor protection and shareholder rights, which calls into question the corporate governance of US companies. Therefore, the first empirical study of this research examined whether the overseas Chinese listings do outperform non-cross-listed Chinese firms under the theoretical framework of bonding theory. This study is actually the consistent estimation of the relationship between corporate governance and firm performance, by taking into account both domestic and overseas Chinese listings. By looking at the different measures of governance, empirical results showed that CEO-Chairperson separation, international accounting standards, board size, and supervisory panel fail to explain firm performance of those cross-listed Chinese firms, which is especially relevant in light of the prominence that board independence and financial disclosure have received in the

recent NYSE and NASDAQ corporate governance listing requirements (Bhagat and Bolton, 2008). Further, to explore the inter-relationship between cross-listing and corporate governance mechanisms and firm performance, this study revealed that different markets have different combined effects of cross-listing and corporate governance practices. For example, Chinese firms with bigger board sizes have better firm performance in the London market; however, Chinese firms with bigger board size have lower firm performance in the New York market. Overall, the results revealed that the non-cross-listed Chinese firms outperform cross-listed Chinese firms in all of the foreign markets with the one exception of the cross-listings on the NASDAQ market.

The above findings have important implications for senior policy makers and corporate boards. With more and more Chinese firms listing their shares in international markets, the purpose of this cross-listing must be clear. From this study, cross-listing doesn't guarantee improving firm performance by adopting more stringent disclosures and more effective corporate governance practices. However, this study provides useful information to the policy makers to design best practice codes tailored to both the Chinese institutional background and the current level of capital market development in China. For corporate boards, this study also provides useful guidance in designing corporate governance mechanisms to enhance firm valuations.

On the contrary, this study indirectly supports the arguments put forward in the literature by Licht (2004) who questioned whether foreign elements can be neatly 'plugged-in' to an existing corporate governance system and produce the expected improvements. He argues that the cultural uniqueness of people, firms or nations could create 'cultural distance' between the two different systems, which may lead to a situation in which the cross-listing and bonding may not lead to corporate governance improvements. Since the institutional and cultural setting in China may be significantly different from that in developed countries and more advanced economies, it is not surprising to see that the non-cross-listed Chinese firms could perform the same or even better than the cross-listed Chinese firms.

This result could be attributed to different factors. China has continued to make improvements to stock markets over the last two decades. Since 1992, more than 300 laws, regulations, rules, standards and guidelines concerning the securities and futures of markets have been stipulated by the Chinese legislative and administrative authorities,

which form the basis of the legal framework for securities and futures markets (CSRC report 2000). Rules on information disclosure, accounting standards and regulations for listed firms are in place. Auditing standards, separation of the Certified Public Accountant (CPA) firms from the state system, internal control systems, and monitoring of related party transactions are established. The role of the board of directors, supervisory committees and auditors in information disclosure are identified (CSRC report 2000). All these actions could create a better corporate governance system and market environment for the listed companies at the country level. Therefore, it was not surprising to see that the second empirical study (chapter 4) revealed an improved integrated market condition between China A and China B-share markets.

8.1.2 Conclusion of the Second Empirical Study

With more and more Chinese securities dual and triple-listed in several international markets, investors and researchers might be interested in looking at the inter-relationship of those cross-listings. The second empirical study examined market co-movement, price linkage, causality relationship and dynamic price adjustment between dual-listed Chinese securities by using different econometric methods.

Although the price disparity of Chinese dual-listed securities are readily observed, the return analyses of the Chinese dual and triple listings present a similar return and variance pattern. However, the identical shares traded both in Hong Kong and China A markets, China A and New York markets have a lower correlation relationship, which present some significant diversification benefits in portfolio management. Further, cross-listing share prices are affected by the location of trade.

The empirical results of cointegrating analysis revealed a future cointegrated trend for the Chinese local stock markets. Most of the previous studies suggest that China A, China B and Hong Kong are segmented markets, which this thesis supports to some extent. However, by examining the individual dual-listed securities, we can see that most of the dual-listed China A- and B-shares have a long-run equilibrium relationship, and some of the dual-listed China A and Hong Kong shares have also long-run equilibrium relationship. This result suggests that the reforms to the China stock market are working gradually. The long run cointegration relation between two price series of China A and New York are also examined by using Engle-Granger's cointegration

analysis (1987) and Johansen's (1991) cointegration analysis. The cointegration test results suggest there is no long run relationship between the two price series.

The empirical evidence in terms of information transmission and price discovery has been mixed so far. Some studies suggest that home market plays a dominant role in price discovery; other studies support a significant role in price formation both at home and in the U.S. market. This study not only extends the literature by examining how, but also provides a differentiation from other studies by examining information transmission and price discovery for dual and triple listings from emerging markets of China to developed countries like the U.S. The Granger Causality test showed that most of the dually listed stocks in China A Granger Cause the stock in China B, China A Granger Cause Hong Kong. However, for the Chinese securities triple listed in China A, Hong Kong, and New York, Granger Causality runs one way from Hong Kong to China A, and New York from China A. This result indicates that triple-listed Chinese securities that cross-listed in Hong Kong and New York appear to play a more significant role in information transmission in the pricing process, and the home market of China seems to be a satellite market. The reasons behind this finding could be attributed to the emerging characteristics of the China stock market.

In summary, the Chinese A-share market is still segmented from the U.S. market and the Hong Kong market for its cross-listed shares as of December 2008. However, the Chinese A-share market is gradually integrating with the Chinese B-share market and the Hong Kong market in terms of the cross-listings.

8.1.3 Conclusion of the Third Empirical Study

Lastly, the arbitrage opportunities in the Hong Kong and New York markets for Chinese dual-listed securities were examined. By using a very simple trading strategy of buying low and selling high, considering the market risk and transaction costs, the third empirical study examines the possible arbitrage profits for a portfolio of 14 dual listed stocks that are traded in both the Hong Kong and New York markets. It reports that an average daily return of 1.28 per cent over the period studied could be earned. However, the non-overlap of trading time could deter arbitrage opportunities and increase risks. In other words, the results should be interpreted with caution.

8.2 Contributions of This Research

This research is an empirical study relating to the Chinese cross-listing phenomenon. At the conceptual level, this study contributes to the literature on bonding theory by shifting the focus from the conventional cross-listing by developed country firms to the newly emerging unconventional cross-listing of Chinese listed firms. At the frontline of this new stream of research, this study is the first to provide an empirical test of the bonding theoretical framework with a much broader dataset (covering more markets) under the Chinese context. The findings of this study confirm that prior studies cannot fully explain the corporate governance practice of Chinese listed firms. This study has made a unique contribution to the literature in the research of cross-listing and bonding theory.

The purpose of the study of the interaction of Chinese dual-listings (refer to Chapter 4) is to extend the literature by examining how and to what extent the trading of the cross-listed Chinese securities in the two local markets, the U.S. and Hong Kong markets, contributes to information flow and short term price correction for the corresponding stocks traded in China as of December 2008. Previously, some of the studies treated Hong Kong as a "pseudo home" market for Chinese dual-listings (Xu & Fung 2002). However, these dual-listed Chinese companies have headquarters located in Mainland China. Therefore, one of the contributions of this study is that we distinguish home market (Mainland China) from pseudo home market (Hong Kong) as the essential factor to examine the price interaction effects. Another contribution of the study is that we differentiate our study from previous studies that examine price interaction for cross-listings from developed and developing countries in the U.S., but also from studies that examine Chinese cross-listing in local two markets (A and B share market) with capital control restrictions.

Specifically, the findings of this study contribute to the knowledge of the Chinese cross-listing phenomenon. In addition, a relatively straight forward arbitrage trading strategy was tailored specifically for dual-listed Chinese securities in Hong Kong and New York, and was empirically tested. It was found that this investment strategy for dual-listings could work in most of the cases, and perhaps might work in other markets.

8.3 Limitations of This Research

This study shifts the focus of academic research on the China stock market and securities from locally listed Chinese securities to internationally listed Chinese securities. As with all research in its early stage, this study is not without limitations.

Firstly, a limitation of this thesis is that the Chinese financial market is constantly changing. Therefore, the results revealed in this study might be different to those of future studies. Whilst a great deal of effort has been made to produce a timely work, this is an unavoidable limitation of this study.

Secondly, the sample size of the empirical test in regards to corporate governance is not large. Although there are over 500 Chinese securities listed overseas, some of the data are missing. Another concern about the data is the quality; especially in regards to the Chinese dual-listed securities data provided by GTA Company (see Chapter 3). The ownership data for the Chinese securities dual-listed in Mainland China and the Hong Kong market provided by GTA is less accurate than the data obtained directly from annual reports. Thus, a great deal of effort was put into reading thousands of annual reports to sort out the exact ownership data for those cross-listed Chinese firms. This also sheds some light for future researchers when they need to deal with Chinese data.

8.4 Future Research

The following aspects have been identified as potential directions for future research.

In relation to the corporate governance issue, since the independent director system and the domestic Chinese supervisory system seem to have little effect on performance enhancement, another research question might be: ‘why is the explanatory power of the independent director system and supervisory system somewhat unconvincing?’ Alternatively, foreign ownership in these cross-listed Chinese securities could be added to examine the explanatory power of firm performance for those cross-listed Chinese firms. Questionnaires and interview techniques could be adopted to further explore the corporate governance issue in the Chinese context.

This thesis also explored the flow of information in an international multi-market setting and the relationship between market integration and LOP based on individual securities. The cointegration analysis was based on the assumption that the relationship between the dual-listed securities is linear. However, this is not always the case. In the future, we might explore the causality relationship between the dual-listed securities in different periods with a non-linear causality test. Meanwhile, the identical stocks listed in various markets bring out one phenomenon known as dominant and satellite markets, which concludes that foreign listings might have some impact on securities markets' microstructures. However, arbitrage activities do not create a single market for each stock. Future study on cross-listing could be focused on market microstructure. Since the short selling rules are likely to be loosened in the Chinese market soon, future studies could address the question of whether arbitrage could bring the Chinese asset price to equilibrium.

As an emerging economy, Chinese authorities play a major part in activities of stock markets, and keep shaping the domestic financial markets. It is reported that China may launch an international board as soon as this year (2011) or next year (2012) in Shanghai as the country wants to boost the global profile of the RMB currency and further liberalize its capital markets[3]. Global firms, including HSBC, who has prepared to raise five under the Chinese international board, Standard Chartered, Unilever and Coca-Cola Co have already expressed interest for a listing on the international board. Since there is shortage of supply of high-quality stocks in China, the launch of the international board would be greatly welcomed by industry leaders. In addition to the Growth Enterprise Board established in Shenzhen a few years ago, these newly established markets will offer a worthwhile opportunity for researchers to study and examine these markets.

Lastly, other techniques could be used to seek arbitrage profits between cross-listed securities. Vidyamurthy (2004) provides a detailed theoretical cointegration technique for pairs trading strategy. This could be empirically tested with cross-listed securities in future.

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List of Related Publications

Refereed Conference Papers

Lixian Liu, Tony Naughton, Vikash Ramiah, (2009), Cross-Listing, Corporate Governance, and Bonding Hypothesis: A Panel Data Analysis, *Journal of Corporate Finance Conference* (23rd August – 25th August 2009), Peking University, Beijing, China.

Lixian Liu, Tony Naughton, (2009), Cross-Listing, Corporate Governance, and Bonding Hypothesis: A Cross-Section Time Series Analysis, *the 21st Association for Chinese Economic Studies Australia (ACES) Annual Conference* (14th July – 16th July, 2009), RMIT University, Melbourne, Australia.

Lixian Liu, Sivagowry Srianantha kumar, Vikash Ramiah, Tony Naughton (2011), Interaction of Chinese Dual- and Triple-listed Securities, *Global Accounting, Finance and Economics Conference* (14-15th February, 2011), Monash University, Melbourne, Australia.

Appendix 1: Chinese Cross-listing Information

Appendix 1.1: Chinese Firms Listed on New York Stock Exchange

New York Stock Exchange

Name	Symbol	Listing Date	ADR Ratio	Industry
Acorn International, Inc.	ATV	3-May-07	1:3	General Retailers
Agria Corporation	GRO	7-Nov-07	1:2	Food Producers
Aluminum Corp. of China Ltd.	ACH	11-Dec-01	1:25	Industrial Metals
American Dairy, Inc.	ADY	18-Apr-05	1:1	Food Products
American Oriental Bioengineering, Inc.	AOB	18-Dec-06	1:1	Food Products
China Digital TV Holding	STV	5-Oct-07	1:1	Software & Computer Services
China Distance Education	DL	4-Feb-09	1:4	Support Services
China Eastern Airlines	CEA	4-Feb-97	1:100	Travel & Leisure
China Life Insurance	LFC	17-Dec-03	1:40	Life Insurance
China Mass Media International Adve	CMM	4-Aug-08	1:30	Media
China Mobile Limited	CHL	22-Oct-97	1:5	Mobile Telecom.
China National Offshore Oil-CNOOC	CEO	20-Feb-01	1:100	Oil & Gas Producers
China Nepstar Chain Drugsotre	NPD	9-Nov-07	1:2	Food &Drug Retailers
China Netcom Group Corporation (Hong Kong) Limited	CN	16-Nov-04	1:20	Mobile Telecom.
China Petroleum & Chemical	SNP	18-Oct-00	1:100	Oil & Gas Producers
China Security & Surveillance Technology, Inc.	CSR	29-Oct-07	1:1	Oil & Gas Producers
China South Airlines	ZNH	30-Jul-97	1:50	Travel & Leisure
China Telecom	CHA	14-Nov-02	1:100	Fixed Line Telecom.
China Unicom Limited	CHU	21-Jun-00	1:10	Mobile Telecom.
E-House (China) Holding	EJ	8-Aug-07	1:1	Real Estate
General Steel Holdings, Inc.	GSI	8-Aug-08	1:1	Industrial Metals
Giant Interactive Group	GA	1-Nov-07	1:1	Tech.Hardware & Equipment
Guangshen Railway	GSH	13-May-96	1:50	Travel & Leisure
Gushan Environmental Energy Limited	GU	19-Dec-07	1:2	Specialty Chemicals
Huaneng Power International	HNP	6-Oct-94	1:40	Electricity
LDK Solar	LDK	1-Jun-07	1:1	Electron.&Electric Equipment
Longtop Financial Technologies	LFT	24-Oct-07	1:1	Software&ComputerSvc
Mindray Medical International	MR	26-Sep-06	1:1	HealthCareEquip.&Ser
New Oriental Education & Technology	EDU	7-Sep-06	1:4	General Retailers
Noah Education Holdings	NED	19-Oct-07	1:1	Software & Computer Services
PetroChina	PTR	6-Apr-00	1:100	Oil & Gas Producers
Qiao Xing Mobile Communication Co., Ltd.	QXM	3-May-07	1:1	Telecommunications Equipment
ReneSola	SOL	29-Jan-08	1:2	Alternative Energy
Semiconductor Manufacturing International Corporation	SMI	17-Mar-04	1:50	Semiconductors
Simcere Pharmaceutical	SCR	20-Apr-07	1:2	Pharma. & Biotech.
Sinopec Shanghai Petrochemical	SHI	26-Jul-93	1:100	Chemicals
Suntech Power	STP	14-Dec-05	1:1	Electron .& Electric Equipment
Tongjitang Chinese Medicines	TCM	16-Mar-07	1:4	Pharma. & Biotech.
Trina Solar	TSL	19-Dec-06	1:100	Electron. & Electric Equipment
Vanceinfo Technologies, Inc.	VIT	12-Dec-07	1:1	Software & Computer Services
WSP Holdings Limited	WH	6-Dec-07	1:2	OilEquip.Serv. & Distribution
WuXi Pharmatech	WX	9-Aug-07	1:8	Pharma. & Biotech.
Xinyuan Real Estate Co., Ltd.	XIN	12-Dec-07	1:2	Real Estate
Yanzhou Coal Mining	YZC	31-Mar-98	1:50	Mining
Yingli Green Energy	YGE	8-Jun-07	1:1	Electron. & Electric Equipment

Sources: New York Stock Exchange Website, and New York Bank ADR Website, by 30 April 2009

Appendix 1.2: Chinese Firms Listed on NASDAQ

NASDAQ				
Name	**Symbol**	**Listing Date**	**ADR Ratio**	**Industry**
3SBIO	SSRX	07-Feb-07	1:7	Pharma. & Biotech.
51job	JOBS	29-Sep-04	1:2	Support Services
Actions Semiconductor	ACTS	30-Nov-05	1:6	Tech. Hardware & Equipment
Airmedia	AMCN	07-Nov-07	1:2	Media
ATA Inc	ATAI	28-Jan-08	1:02	General Retailers
Baidu.com	BIDU	08-May-05	1:1	Software & Computer Services
Changyou.com	CYOU	07-Apr-09	1:02	Software & Computer Services
China Finance Online	JRJC	15/10/2004	1:5	Software & Computer Services
China GrenTech	GRRF	19/01/2005	1:25	Tech. Hardware & Equipment
China Medical Technologies	CMED	10-Aug-05	1:10	Health Care Equipment & Services
China Sunergy	CSUN	17-May-07	1:6	Electricity
China Techfaith Wireless Communication	CNTF	06-May-05	1:15	Tech. Hardware & Equipment
ChinaEdu	CEDU	11-Dec-07	1:3	General Retailers
CNInsure	CISG	31-Oct-07	1:20	Nonlife Insurance
CTrip.com International	CTRP	09-Dec-03	1:2	Travel & Leisure
eLong	LONG	28-Apr-04	1:2	Travel & Leisure
Focus Media	FMCN	13-Jul-05	1:10	Media
Home Inns & Hotels Management	HMIN	26-Oct-06	1:2	Travel & Leisure
Hurray!	HRAY	04-Feb-05	1:100	Mobile Telecom.
JA Solar	JASO	07-Feb-07	1:3	Electron. & Electric Equipment
Jinpan International Ltd	JST	06-Feb-98	Common Stock	Manufacturing: High Technology
KongZhong	KONG	09-Jul-04	1:40	Mobile Telecom.
Linktone	LTON	04-Mar-04	1:10	Mobile Telecom.
Netease.com	NTES	30-Jun-00	1:25	Software & Computer Services
Ninetowns Internet Technology	NINE	03-Dec-04	1:1	Software & Computer Services
Perfect World (B)	PWRD	26-Jul-07	1:5	Software & Computer Services
Shanda Interactive Entertainment	SNDA	13-May-04	1:2	Leisure Goods
Solarfun Power	SOLF	20-Dec-06	1:5	Electron. & Electric Equipment
Spreadtrum Communications	SPRD	27-Jun-07	1:3	Tech. Hardware & Equipment
Sina	SINA	2001	1:01	Software & Computer Services
The9	NCTY	15-Dec-04	1:1	Leisure Goods
Vimicro International	VIMC	15-Nov-05	1:4	Tech. Hardware & Equipment
VisionChina Media	VISN	06-Dec-07	1:1	Media
Xinhua Finance Media	XFML	09-Mar-07	1:2	Media

Sources: New York Bank ADR Website, by 30 April, 2009

Appendix 1.3: Chinese Firms Listed on Over-the-Counter Market

Over the Counter Market

Name	Symbol	Effective Date	ADR Ratio	Industry
Air China	AIRYY	Jun 30, 2006	1:20	Travel & Leisure
Angang Steel	ANGGY	Dec 06, 2002	1:40	Indust.Metals&Mining
Anhui Conch Cement Company	AHCHY	Nov 03, 2008	1:5	Food &Drug Retailers
Anton Oilfield Services	ATONY	Jan 12, 2009	1:200	OilEquip.,Serv.&Dist
Asia Cement China	AACEY	Jan 12, 2009	1:20	Construct.&Materials
Bank of China	BACHY	Oct 20, 2008	1:25	Banks
Bank of Communications	BCMXY	Apr 10, 2009	1:25	Financial Services
Beijing Beida Jade Bird Universal Sci-Tech	BJBJY	Dec 20, 2005	1:40	Software&ComputerSvc
Beijing Capital International Airpo	BJCHY	Nov 03, 2008	1:5	Travel & Leisure
Brilliance China Automotive	BCAHY	Jul 26, 2007	1:100	Automobiles & Parts
BYD	BYDDY	Oct 10, 2008	1:10	Tech.Hardware&Equip.
China Bluechemical	CBLUY	Jan 12, 2009	1:50	Chemicals
China Coal Energy	CCOZY	Apr 02, 2009	1:20	Mining
China Communications Construction	CCCGY	Nov 10, 2008	1:20	IndustrialTransport.
China Construction Bank Corporation	CICHY	Oct 20, 2008	1:50	Banks
China COSCO Holdings	CICOY	Oct 10, 2008	1:5	IndustrialTransport.
China Foods	CHFHY	Oct 10, 2008	1:20	Food Producers
China International Marine Containers (Group) Co.,	CHAOY	Nov 03, 2008	1:20	Construct.&Materials
China National Materials Company	CASDY	Mar 06, 2009	1:20	Construct.&Materials
China Oilfield Services	CHOLY	Mar 26, 2004	1:20	OilEquip.,Serv.&Dist
China Railway	CRWOY	Nov 03, 2008	1:25	Construct.&Materials
China Railway Construction	CWYCY	Nov 03, 2008	1:10	Construct.&Materials
China Shenhua Energy	CSUAY	Oct 20, 2008	1:10	Alternative Energy
China Shineway Pharmaceutical	CSWYY	Oct 10, 2008	1:20	Pharma. & Biotech.
China Shipping Development	CSDXY	Mar 01, 1996	1:50	IndustrialTransport.
China South Locomotive	CSRGY	Jan 12, 2009	1:25	IndustrialTransport.
China Vanke	CVKEY	Nov 03, 2008	1:20	Real Estate Inv&Serv
China Wireless Technologies	CHWTY	Sep 12, 2006	1:20	Tech.Hardware&Equip.
ChinaCast Communication	CCHYY	Dec 06, 2004	1:30	Software&ComputerSvc
Datang International Power Generation	DIPGY	Sep 04, 2001	1:20	Electricity
Dongfeng Motor Group	DNFGY	Jan 27, 2009	1:50	Automobiles & Parts
Double Coin	DCHLY	Oct 01, 1995	1:10	Automobiles & Parts
Far East Pharmaceutical Technology	FEPTY	Mar 02, 2004	1:100	Pharma. & Biotech.
Fosun International	FOSUY	Nov 03, 2008	1:25	Pharma. & Biotech.
Foxconn International Holdings	FXCNY	Oct 20, 2008	1:20	Tech.Hardware&Equip.
Golden Meditech	GMDTY	Jan 12, 2009	1:20	HealthCareEquip.&Ser
Guangzhou Investment	GUAZY	Dec 09, 1999	1:20	Real Estate Inv&Serv
Guangzhou Pharmaceutical	GZPHY	Jun 21, 2002	1:20	Pharma. & Biotech.
Guangzhou R&F Properties Co., Ltd.	GZUHY	Nov 03, 2008	1:20	Real Estate Inv&Serv
Guangzhou Shipyard International	GSHIY	Jul 13, 1995	1:10	Industrial Engineer.
Hopewell Highway Infrastructure	HHILY	Apr 26, 2004	1:10	Construct.&Materials
Huadian Power International	HPIFY	Jan 12, 2009	1:30	Electricity
Industrial and Commercial Bank of China	IDCBY	Oct 20, 2008	1:50	Banks
Jiangsu Expressway	JEXYY	Dec 23, 2002	1:20	IndustrialTransport.
Jiangxi Copper	JIXAY	Oct 07, 2003	1:40	Mining
Jutal Offshore Oil Services	JUTOY	Jan 12, 2009	1:250	Oil & Gas Producers
Kingdee International Software Group	KGDEY	Nov 10, 2008	1:100	Software&ComputerSvc
Lianhua Supermarket Holdings	LHUAY	Jan 12, 2009	1:50	Food &Drug Retailers
Parkson Retail	PKSGY	Apr 02, 2009	1:30	General Retailers
Ping An Insurance Company of China	PNGAY	Mar 28, 2005	1:2	Life Insurance
Shandong Molong Petroleum Machinery	SHANY	Jan 12, 2009	1:1000	OilEquip.,Serv.&Dist
Shanghai Chlor-Alkali Chemical	SLLBY	Mar 01, 1994	1:10	Chemicals
Shanghai Electric	SIELY	Jan 13, 2009	1:20	General Industrials
Shanghai Erfangji	SHFGY	Dec 01, 1993	1:10	Industrial Engineer.
Shanghai Forte Land	SGFTY	Jan 27, 2009	1:100	Real Estate Inv&Serv
Shanghai Jin Jiang Intl Hotel	SJJIY	Dec 15, 2006	1:100	Leisure Goods
Shanghai Jinqiao Processing Dev	SJQIY	Jul 01, 1996	1:10	Real Estate Inv&Serv
Shanghai Lujiazui Finance & Trade Zone Developm	SLUJY	Jul 01, 1996	1:5	Real Estate Inv&Serv
Shanghai Waigaoqiao Free Trade Zone	SGOTY	May 01, 1995	1:5	Real Estate Inv&Serv
Shanghai Zhenhua Port Machinery	SZPMY	Oct 10, 2008	1:10	Industrial Engineer.
Shenzhen S.E.Z. Real Estate and Properties	SZPRY	Aug 01, 1994	1:10	Real Estate Inv&Serv
Sino-Ocean Land	SIOLY	Apr 02, 2009	1:20	Real Estate Inv&Serv
SINOTRUK (HONG KONG)	SHKLY	Nov 03, 2008	1:50	General Industrials
Synear Food	SYNRY	Oct 10, 2008	1:50	Food Producers
Tianjin Capital Environmental Protection	TCEPY	Dec 23, 2003	1:20	Gas,H20&Multiutility
Tingyi (Cayman Islands)	TCYMY	Jan 23, 2006	1:20	Food Producers
TravelSky Technology	TSYHY	Dec 27, 2002	1:10	Software&ComputerSvc
Tsingtao Brewery	TSGTY	Feb 01, 1996	1:10	Beverages
Weichai Power	WEICY	Jan 12, 2009	1:10	Automobiles & Parts
Xinao Gas Holdings	XNGSY	Nov 03, 2008	1:25	Oil & Gas Producers
Zhejiang Expressway	ZHEXY	Feb 14, 2002	1:30	IndustrialTransport.
Zijin Mining Group	ZIJMY	Apr 10, 2009	1:20	Mining
ZTE	ZTCOY	Oct 10, 2008	1:2	Mobile Telecom.

Sources: New York Bank ADR Website, by 30 April, 2009

Appendix 1.4: Chinese Firms Listed on American Stock Exchange and Other

American Stock Exchange

Company Name	Symbol	Listing Date	Industry
China Architectural Engineering	RCH	28-Sep-07	Construction and Contracting
China Shen Zhou Mining & Resources, Inc	SHZ	11-Apr-97	Metals Mining
China Shenghuo Pharmaceutical Holdings, Inc	KUN	14-Jun-07	Health Services, Pharmaceuticals, and Medical Diagnostics
New Dragon Asia Corp	NWD	28-Apr-00	Manufacturing: Consumer
Sinovac Biotech Ltd	SVA	26-Sep-03	Health Services, Pharmaceuticals, and Medical Diagnostics
Tiens Biotech Group (USA), Inc	TBV	14-May-03	Health Services, Pharmaceuticals, and Medical Diagnostics

Sources: American Stock Exchange Website, by 30 April, 2009

Other Issues

Name	Symbol	Effective Date	ADR Ratio	Industry
China Shipping Development - 144A		Nov 01, 1994	1:100	Industrial Transportation
Harbin Power Equipment - 144A	HPECYP	Dec 14, 1994	1:100	Industrial Engineering
Jiangling Motors - Reg. S	--	Sep 29, 1995	1:100	Industrial Engineering
Maansham Iron & Steel - 144A	MAAPP	Nov 01, 1993	1:100	Industrial Metals
Ping An Insurance Company of China - 144.	PINGYP	Jun 17, 2004	1:20	Life Insurance
Qingling Motor - 144A	QIGPP	Aug 11, 1994	1:50	Industrial Engineering
Qingling Motor - Reg. S	--	Aug 11, 1994	1:50	Industrial Engineering
Sinopec Yizheng Chemical Fibre	YIRPP	Mar 25, 1994	1:100	Chemicals
Suntech Power - 144A	N/A	Feb 12, 2007	1:1	Electron.&Electric Equipment
Tingyi (Cayman Islands) - 144A	TINGYP	Feb 01, 1996	1:100	Food Producers
Zhejiang Southeast Electric Power - 144A	ZHJGYP	Sep 11, 1997	1:50	Electricity

Sources: New York ADR Website, by 30 April, 2009

Appendix 1.5: Chinese Firms Listed on Hong Kong Mainboard

Hong Kong Stock Exchange Mainboard

Company	Listing Date	Stock Code	Industry
Advanced Semiconductor Manufacturing Corporation Ltd	7/04/2006	3355	Semiconductors
Air China Ltd	15/12/2004	753	Travel & Leisure
Aluminum Corporation of China Ltd	12/12/2001	2600	Industrial Metals & Mining
Angang Steel Co Ltd	24/07/1997	347	Industrial Metals & Mining
Anhui Conch Cement Co Ltd	21/10/1997	914	Construction and Material
Anhui Expressway Co Ltd	13/11/1996	995	Industrial Transportation
Anhui Tianda Oil Pipe Co Ltd	24/12/2007	839	Industrial Supplier
AviChina Industry & Technology Co Ltd	30/10/2003	2357	Industrial Engineering
Bank of China Ltd	1/06/2006	3988	Banks
Bank of Communications Co, Ltd	23/06/2005	3328	Banks
Baoye Group Co Ltd	30/06/2003	2355	Industrial Construction
Beijing Capital International Airport Co Ltd	1/02/2000	694	Travel and Leisure
Beijing Capital Land Ltd	19/06/2003	2868	Real Estate Investment & Service
Beijing Jingkelong Co Ltd	26/02/2008	814	Personal Goods
Beijing Media Corporation Ltd	22/12/2004	1000	Media
Beijing North Star Co Ltd	14/05/1997	588	Real Estate Investment & Service
Beiren Printing Machinery Holdings Ltd	6/08/1993	187	Industrial Engineering
BYD Co Ltd	31/07/2002	1211	Industrial Products
CATIC Shenzhen Holdings Ltd	29/09/1997	161	General Retailer
Chengdu PUTIAN Telecommunications Cable Co Ltd	13/12/1994	1202	Technology Hardware & Equipment
China BlueChemical Ltd	29/09/2006	3983	Chemicals
China CITIC Bank Corporation Ltd	27/04/2007	998	Banks
China Coal Energy Co Ltd	19/12/2006	1898	Mining
China Communications Construction Co Ltd	15/12/2006	1800	Industrial Transportation
China Communications Services Corporation Ltd	8/12/2006	552	Telecommunications Equipment
China Construction Bank Corporation	27/10/2005	939	Banks
China COSCO Holdings Co Ltd	30/06/2005	1919	Industrial Transportation
China Eastern Airlines Corporation Ltd	5/02/1997	670	Travel and Leisure
China Life Insurance Co Ltd	18/12/2003	2628	Life Insurance
China Merchants Bank Co, Ltd	22/09/2006	3968	Banks
China Molybdenum Co, Ltd	26/04/2007	3993	Mining
China National Building Material Co Ltd	23/03/2006	3323	Industrial Engineering
China National Materials Co Ltd	20/12/2007	1893	Industrial Engineering
China Oilfield Services Ltd	20/11/2002	2883	Oil Equipment & Services
China Petroleum & Chemical Corporation	19/10/2000	386	Oil & Gas Producers
China Railway Construction Corporation Ltd	13/03/2008	1186	Construction & Materials
China Railway Group Ltd	7/12/2007	390	Construction & Materials
China Shenhua Energy Co Ltd	15/06/2005	1088	Electricity
China Shipping Container Lines Co Ltd	16/06/2004	2866	Industrial Transportation
China Shipping Development Co Ltd	11/11/1994	1138	Industrial Transportation
China South Locomotive & Rolling Stock Corporation Ltd	21/08/2008	1766	Industrial Machinery
China Southern Airlines Co Ltd	31/07/1997	1055	Travel and Leisure
China Telecom Corporation Ltd	15/11/2002	728	Fixed Line Telecommunications
Chongqing Iron & Steel Co Ltd	17/10/1997	1053	Industrial Metals & Mining
Chongqing Machinery & Electric Co Ltd	13/06/2008	2722	Industrial Machinery
Dalian Port (PDA) Co Ltd	28/04/2006	2880	Logistics Services
Datang International Power Generation Co, Ltd	21/03/1997	991	Electricity
Dongfang Electric Corporation Ltd	6/06/1994	1072	Industrial Engineering
Dongfeng Motor Group Co Ltd	7/12/2005	489	Automobile and Parts
First Tractor Co Ltd	23/06/1997	38	Industrial Machinery
Great Wall Motor Co Ltd	15/12/2003	2333	Automobile and Parts
Great Wall Technology Co Ltd	5/08/1999	74	Technology Hardware & Equipment
Guangdong Nan Yue Logistics Co Ltd	26/10/2005	3399	Logistics Services
Guangshen Railway Co Ltd	14/05/1996	525	Travel & Leisure
Guangzhou Pharmaceutical Co Ltd	30/10/1997	874	Pharmaceuticals & Biotechnolog
Guangzhou R&F Properties Co, Ltd	14/07/2005	2777	Equity Investment
Guangzhou Shipyard International Co Ltd	6/08/1993	317	Industrial Transportation

Appendix 1.5*:* Chinese Firms Listed on Hong Kong Mainboard (cont.)

Hong Kong Stock Exchange Mainboard

Company	Listing Date	Stock Code	Industry
Hainan Meilan International Airport Co Ltd	18/11/2002	357	Industrial Transportation
Harbin Power Equipment Co Ltd	16/12/1994	1133	Electricity
Hisense Kelon Electrical Holdings Co Ltd #	23/07/1996	921	Household Goods & Home Construction
Huadian Power International Corporation Ltd	30/06/1999	1071	Electricity
Huaneng Power International, Inc	21/01/1998	902	Electricity
Hunan Nonferrous Metals Corporation Ltd	31/03/2006	2626	Industrial Metals & Mining
Industrial and Commercial Bank of China Ltd	27/10/2006	1398	Banks
IRICO Group Electronics Co Ltd	20/12/2004	438	Electronic Equipment
Jiangsu Expressway Co Ltd	27/06/1997	177	Travel and Leisure
Jiangxi Copper Co Ltd	12/06/1997	358	Industrial Metals & Mining
Jilin Qifeng Chemical Fiber Co Ltd	21/06/2006	549	Industrial Supplier
Jingwei Textile Machinery Co Ltd	2/02/1996	350	Industrial Engineering
Lianhua Supermarket Holdings Co Ltd	27/06/2003	980	General Retailer
Lingbao Gold Co Ltd	12/01/2006	3330	Mining
Luoyang Glass Co Ltd	8/07/1994	1108	General Retailer
Maanshan Iron & Steel Co Ltd	3/11/1993	323	Industrial Metals & Mining
Nanjing Panda Electronic Co Ltd	2/05/1996	553	Electronic Equipment
Northeast Electric Development Co Ltd	6/07/1995	42	Electronic Equipment
PetroChina Co Ltd	7/04/2000	857	Oil & Gas Producers
PICC Property and Casualty Co Ltd	6/11/2003	2328	Insurance
Ping An Insurance (Group) Co of China Ltd	24/06/2004	2318	Insurance
Qingling Motors Co Ltd	17/08/1994	1122	Automobile and Parts
Shandong Chenming Paper Holdings Ltd	18/06/2008	1812	Forestry & Paper
Shandong Molong Petroleum Machinery Co Ltd	7/02/2007	568	Industrial Machinery
Shandong Xinhua Pharmaceutical Co Ltd	31/12/1996	719	Pharmaceuticals & Biotechnolog
Shanghai Electric Group Co Ltd	28/04/2005	2727	Electronic Equipment
Shanghai Forte Land Co Ltd	6/02/2004	2337	Real Estate Investment & Service
Shanghai Jin Jiang Int'l Hotels (Group) Co Ltd	15/12/2006	2006	Travel and Leisure
Shanghai Prime Machinery Co Ltd	27/04/2006	2345	Industrial Machinery
Shenji Group Kunming Machine Tool Co Ltd	7/12/1993	300	Industrial Engineering
Shenyang Public Utility Holdings Co Ltd #	16/12/1999	747	Gas, Water & Multiutilities
Shenzhen Expressway Co Ltd	12/03/1997	548	Industrial Transportation
Sichuan Expressway Co Ltd	7/10/1997	107	Industrial Transportation
Sichuan Xinhua Winshare Chainstore Co Ltd	30/05/2007	811	General Retailer
Sinopec Shanghai Petrochemical Co Ltd	26/07/1993	338	Chemicals
Sinopec Yizheng Chemical Fibre Co Ltd	29/03/1994	1033	Chemicals
Sinotrans Ltd	13/02/2003	598	Logistics Services
Tianjin Capital Environmental Protection Co Ltd	17/05/1994	1065	Gas, Water & Multiutilities
TravelSky Technology Ltd	7/02/2001	696	Travel and Leisure
Tsingtao Brewery Co Ltd	15/07/1993	168	Beverages
Weichai Power Co Ltd	11/03/2004	2338	Mining
Weiqiao Textile Co Ltd	24/09/2003	2698	General Retailer
Xiamen International Port Co Ltd	19/12/2005	3378	Industrial Transportation
Xinjiang Tianye Water Saving Irrigation System Co Ltd	24/01/2008	840	Gas, Water & Multiutilities
Xinjiang Xinxin Mining Industry Co Ltd	12/10/2007	3833	Mining
Yanzhou Coal Mining Co Ltd	1/04/1998	1171	Mining
Zhaojin Mining Industry Co Ltd	8/12/2006	1818	Mining
Zhejiang Expressway Co Ltd	15/05/1997	576	Industrial Transportation
Zhejiang Glass Co Ltd	10/12/2001	739	General Retailer
Zhengzhou Gas Co Ltd	29/06/2007	3928	Oil & Gas Producers
Zhuzhou CSR Times Electric Co Ltd	20/12/2006	3898	Electronic Equipment
Zijin Mining Group Co, Ltd	23/12/2003	2899	Mining
ZTE Corporation	9/12/2004	763	Technology Hardware & Equipment

Sources: Hong Kong Stock Exchange website, by April 30, 2009

Appendix 1.6: Chinese Firms Listed on Hong Kong GEM

Hong Kong Stock Exchange GEM

Name	Listing Date	Stock Code	Industry
Beijing Beida Jade Bird Universal Sci-Tech Co Ltd	27/07/2000	8095	Industrial Engineering
Biosino Bio-Technology and Science Incorporation	27/02/2006	8247	Technolodgy Hardware and Equipment
Capinfo Co Ltd	21/12/2001	8157	Software and Computer Services
CCID Consulting Co Ltd	12/12/2002	8235	Consulting
Changan Minsheng APLL Logistics Co Ltd	23/02/2006	8217	Logistics Services
Changmao Biochemical Engineering Co Ltd	28/06/2002	8208	Pharmaceutical
Dahe Media Co Ltd	13/11/2003	8243	Media
EVOC Intelligent Technology Co Ltd	10/10/2003	8285	Industrial Supplier
Jiangsu Nandasoft Technology Co Ltd	24/04/2001	8045	Technolodgy Hardware and Equipment
Jilin Province Huinan Changlong Bio-pharmacy Co Ltd	24/05/2001	8049	Pharmaceutical
Launch Tech Co Ltd	7/10/2002	8196	Technolodgy Hardware and Equipment
Nanjing Sample Technology Co Ltd	9/06/2004	8287	Technolodgy Hardware and Equipment
Ningbo Yidong Electronic Co Ltd	14/11/2003	8249	Electronic Equipment
Northeast Tiger Pharmaceutical Co Ltd	28/02/2002	8197	Pharmaceutical
Powerleader Science & Technology Group Ltd	12/12/2002	8236	Technolodgy Hardware and Equipment
Sanmenxia Tianyuan Aluminum Co Ltd	13/07/2004	8253	Industrial Metal and Mining
Shaanxi Northwest New Technology Industry Co Ltd	3/07/2003	8258	Technolodgy Hardware and Equipment
Shandong Luoxin Pharmacy Stock Co Ltd	9/12/2005	8058	Pharmaceutical
Shandong Weigao Group Medical Polymer Co Ltd	27/02/2004	8199	Medical Equipment
Shanghai Fudan Microelectronics Co Ltd	4/08/2000	8102	Electronic Equipment
Shanghai Fudan-Zhangjiang Bio-Pharmaceutical Co Ltd	13/08/2002	8231	Pharmaceutical
Shanghai Jiaoda Withub Information Industrial Co Ltd	31/07/2002	8205	Software and Computer Services
Shanghai Qingpu Fire-Fighting Equipment Co Ltd #	30/06/2004	8115	Industrial Machinery
Shanghai Tonva Petrochemical Co Ltd	13/07/2005	8251	Chemicals
Shanxi Changcheng Microlight Equipment Co Ltd	18/05/2004	8286	Industrial Machinery
Shenzhen Dongjiang Environmental Co Ltd	29/01/2003	8230	Environment Products and Services
Shenzhen Mingwah Aohan High Technology Corp Ltd	7/07/2004	8301	Technolodgy Hardware and Equipment
Shenzhen Neptunus Interlong Bio-Technique Co Ltd	12/09/2005	8329	Pharmaceutical
Tianjin Binhai Teda Logistics (Group) Corporation Ltd	30/04/2008	8348	Logistics Services
Tianjin TEDA Biomedical Engineering Co Ltd	18/06/2002	8189	Medical Equipment
Tianjin Tianlian Public Utilities Co Ltd	9/01/2004	8290	Gas, Water & Multiutilities
Tong Ren Tang Technologies Co Ltd	31/10/2000	8069	Technolodgy Hardware and Equipment
Wumart Stores Inc	21/11/2003	8277	General Retailer
Xi'an Haitian Antenna Technologies Co Ltd	5/11/2003	8227	Technolodgy Hardware and Equipment
Yantai North Andre Juice Co Ltd	22/04/2003	8259	Beverage
Zheda Lande Scitech Ltd	3/05/2002	8106	Technolodgy Hardware and Equipment
Zhejiang Prospect Co Ltd	18/02/2004	8273	Automobile and Parts
Zhejiang Shibao Co Ltd	16/05/2006	8331	Industrial Products
Zhejiang Yonglong Enterprises Co Ltd	8/11/2002	8211	Chemicals

Sources: Hong Kong Stock Exchange Website, by 30 April, 2009

Appendix 1.7: Chinese Firms Listed on Stock Exchange of Singapore

Singapore Stock Exchange

Name	Listing Date	Industry	Country of Incorporation
8TELECOM INTERNATIONAL HOLDINGSLTD	July 23, 2004	Telecommunications Equipment	
ACE ACHIEVE INFOCOM LTD	November 18, 2004	Telecommunications Equipment	Bermuda
ASIA DEKOR HOLDINGS LTD	November 15, 1999	General Retailers	Bermuda
ASIA ENVIRONMENT HOLDINGS LTD	December 11, 2003	Environmental Products & Service	Singapore
ASIA POWER CORP LTD	November 9, 1999	Electricity	Singapore
ASIA SILK HOLDINGS LTD	May 26, 2005	Personal Goods	Singapore
ASIA TIGER GROUP LTD	January 27, 2005	Industrial Machinery	Singapore
ASIA WATER TECHNOLOGY	March 4, 2005	Environmental Products & Service	Singapore
ASIAPHARM GROUP LTD	May 5, 2004	Pharmaceuticals	Bermuda
AUTOMATED TOUCHSTONE MACHINES LTD	November 17, 2003	Industrial Machinery	Singapore
BEAUTY CHINA HOLDINGS LTD	November 17, 2003	General Retailers	Cayman Islands
BIO-TREAT TECHNOLOGY LTD	February 16, 2004	Environmental Products & Service	Singapore
BRIGHT ORIENT (HOLDING) LTD	November 18, 2003	Personal Goods	Bermuda
BRIGHT WORLD PRECISION MAC LTD	April 27, 2006	Industrial Supplier	Singapore
C & O PHARM TECH (HLDGS) LTD	October 17, 2005	Pharmaceuticals	
CACOLA FURNITURE INTL LIMITED	November 7, 2007	Personal Goods	Cayman Islands
CELESTIAL NUTRIFOODS LTD	January 9, 2004	Food Products	Bermuda
CG TECHNOLOGIES HOLDINGS LTD	April 22, 2005	Personal Goods	Bermuda
CHANGTIAN PLASTIC & CHEMICAL LIMITED	November 9, 2007	Industrial Supplier	Bermuda
CHINA ANGEL FOOD LIMITED	July 13, 2007	Food Products	Singapore
CHINA ANIMAL HEALTHCARE LTD	December 16, 2001	Healthcare Product and Service	Bermuda
CHINA AUTO ELECTRONICS GROUP LIMITED	October 20, 2006	Electronic Equipment	Bermuda
CHINA AVIATION OIL CORP LTD	January 8, 1998	Oil and Gas Producer	Singapore
CHINA BEARING (SINGAPORE) LTD	October 20, 2006	Industrial Engineering	Singapore
CHINA DAIRY GROUP LTD	January 8, 1998	Food Products	Singapore
CHINA ENERGY LIMITED	December 21, 2006	Electricity	Singapore
CHINA ERATAT SPORTS FASHION LIMITED	April 17, 2008	General Retailers	Singapore
CHINA ESSENCE GROUP LTD	August 8, 2000	Food Products	Cayman Islands
CHINA FARM EQUIPMENT LIMITED	February 9, 2006	Industrial Machinery	Singapore
CHINA FASHION HOLDINGS LTD	December 1, 2004	Personal Goods	Singapore
CHINA FLEXIBLE PACKAGING HOLDINGS LTD	November 11, 2004	Industrial Supplier	Bermuda
CHINA FOOD INDUSTRIES LTD	September 25, 2003	Food Products	Singapore
CHINA GREAT LAND HOLDINGS LTD	February 16, 2005	Real Estate	Singapore
CHINA HAIDA LTD	November 24, 2004	Industrial Supplier	Singapore
CHINA HEALTHCARE	2002	Healthcare Product and Service	Singapore
CHINA HONGCHENG HOLDINGS LTD	August 8, 2007	Personal Goods	Bermuda
CHINA HONGXING SPORTS LIMITED	November 14, 2005	General Retailers	Bermuda
CHINA INFRASTRUCTURE HOLDINGS LTD	November 26, 1999	Service	Bermuda
CHINA KANGDA FOOD COMPANY LIMITED	October 9, 2006	Food Products	Bermuda
CHINA LIFESTYLE F&B GROUP LTD	August 26, 2005	Food Products	Bermuda
CHINA MERCHANTS PROPERTY DEVELOPMENT	July 24, 1995	Real Estate	China
CHINA MILK PRODUCTS GROUP LIMITED	March 13, 2006	General Retailers	Cayman Islands
CHINA NEW TOWN DEVELOPMENT COMPANY	November 14, 2007	Real Estate	British Virgin Islands
CHINA OILFIELD TECHNOLOGY	October 17, 2006	Environmental Products & Service	Cayman Islands
CHINA PAPER HOLDINGS LTD	July 14, 2004	General Retailers	Bermuda
CHINA PETROTECH LTD	June 25, 1905	Software and Computer Service	Singapore
CHINA POWERPLUS LIMITED	September 3, 2004	Industrial Machinery	Singapore
CHINA PRECISION TECHNOLOGY LIMITED	May 8, 2006	Electronic Equipment	Singapore
CHINA PRINTING & DYEING HOLDING LIMITED	September 7, 2006	General Retailers	Singapore
CHINA SKY CHEM FIBRE CO.	October 3, 2005	General Retailers	Cayman Islands
CHINA SPORTS INTERNATIONAL LIMITED	July 18, 2007	General Retailers	Bermuda
CHINA SUN BIO-CHEM TECHNOLOGY GROUP CO	November 8, 2004	Food Products	Cayman Islands
CHINA SUNSINE CHEM HLDGS LTD	July 5, 2007	Industrial Supplier	Singapore
CHINA WHEEL HOLDINGS LTD	October 10, 2004	Industrial Supplier	Singapore
CHINA XLX FERTILISER LTD	June 21, 2007	Chemicals	Singapore
CHINA YUANBANG PROP HLDGS LTD	May 9, 2007	Real Estate	Bermuda
CHINA ZAINO INTERNATIONAL LIMITED	April 18, 2008	Maturaturing	Bermuda
CHINACAST COMMUNICATIONS HOLDINGS	May 14, 2004	Telecommunications Equipment	Bermuda
CHT HOLDINGS LTD	September 24, 2003	Industrial Supplier	Bermuda
CMZ HOLDINGS LTD	July 16, 2007	General Retailers	Singapore
CONTEL CORPORATION	December 27, 2005	Telecommunications Equipment	Bermuda
DELONG HOLDINGS LTD	April 8, 1999	Industrial Metal	Singapore
DEVOTION ENERGY GROUP LTD	August 1, 2003	Environmental Products & Service	Singapore
DUTECH HOLDINGS LTD	August 2, 2007	General Retailers	Singapore
EAGLE BRAND HOLDINGS LTD	February 8, 1999	General Retailers	Bermuda
EPURE INTERNATIONAL LTD	October 6, 2006	Environmental Products & Service	Singapore
FABCHEM CHINA LIMITED	April 17, 2006	Chemicals	Singapore
FALMAC LTD	February 21, 1994	Industrial Engineering	Singapore
FERROCHINA LIMITED	May 19, 2005	Industrial Supplier	Bermuda
FIBRECHEM TECHNOLOGIES LTD	April 21, 2004	Chemicals	Bermuda
FM HOLDINGS LIMITED	May 24, 2005	General Retailers	Bermuda
FORELAND FABRICTECH HOLDINGS LIMITED	April 26, 2007	General Retailers	Bermuda

(cont.)

Name	Listing Date	Industry	Country of Incorporation
FUJIAN ZHENYUN PLAS IND CO LTD	August 3, 2007	General Retailers	China
FULL APEX HOLDINGS LTD	June 20, 2003	General Retailers	Bermuda
FUNG CHOI MEDIA GROUP LTD	October 20, 2004	General Retailers	Bermuda
FURAMA LTD		Travel and Leisure	Singapore
FUXING CHINA GROUP LIMITED	September 24, 2007	General Retailers	Bermuda
GUANGZHAO IND FOREST BIOGRP LTD	July 5, 2004	General Retailers	Singapore
HENGXIN TECHNOLOGY LTD	May 11, 2006	Telecommunications Equipment	Singapore
HONGGUO INTERNATIONAL HOLDINGS LTD	June 5, 2003	Personal Goods	Bermuda
HONGWEI TECHNOLOGIES LIMITED	October 24, 2005	Chemicals	Bermuda
JISHAN HOLDINGS LTD	May 10, 2004	General Retailers	Singapore
JIUTIAN CHEMICAL GROUP LIMITED	May 4, 2006	Chemicals	Singapore
JOINN HOLDINGS LIMITED		Software and Computer Service	Bermuda
JUNMA TYRE CORD COMPANY LTD	November 25, 2004	Chemicals	China
JURONG CEMENT LTD		Equity Investment	Singapore
KEDA COMMUNICATIONS LTD	July 25, 2005	Telecommunications Equipment	Bermuda
KXD DIGITAL ENTERTAINMENT LTD	October 27, 2003	Telecommunications Equipment	Singapore
LI HENG CHEM FIBRE TECH LTD	March 12, 2008	Chemicals	Bermuda
LINK HI HOLDINGS LIMITED	May 22, 2006	Industrial Engineering	Singapore
LONGCHEER HOLDINGS LIMITED	May 13, 2005	Software and Computer Service	Bermuda
LUXKING GROUP HOLDINGS LTD	August 22, 2005	Industrial Supplier	Bermuda
LUZHOU BIO-CHEM TECHNOLOGY LTD	February 24, 2006	Food Products	Singapore
MEMSTAR TECHNOLOGY LTD	September 3, 2007	Industrial Supplier	Singapore
MEMTECH INTERNATIONAL LTD	July 22, 2004	Industrial Supplier	Singapore
MIDAS HOLDINGS LTD	February 23, 2004	Industrial Supplier	Singapore
MIDSOUTH HOLDINGS LTD		Industrial Supplier	Singapore
NEW LAKESIDE HOLDINGS LTD	March 24, 2004	Food Products	Singapore
OCEAN INTERNATIONAL HOLDINGS LTD	January 28, 2005	Food Products	Singapore
ORIENTAL CENTURY LIMITED	June 1, 2006	General Retailers	Singapore
ORIENTAL FOOD HOLDINGS LTD	November 19, 2004	Food Products	Singapore
OUHUA ENERGY HOLDINGS LIMITED	November 3, 2006	Oil and Gas Producer	Bermuda
PEOPLE'S FOOD HOLDINGS LTD	March 14, 2001	Food Products	Bermuda
PHARMESIS INTERNATIONAL LTD	October 6, 2004	Pharmaceuticals	Singapore
PINE AGRITECH LIMITED	May 12, 2005	Food Products	Bermuda
R H ENERGY LTD	July 11, 2007	Industrial Engineering	Singapore
REYOUNG PHARM LTD	September 8, 2005	Pharmaceuticals	Bermuda
REYPHON AGRICEUTICAL LIMITED	August 1, 2007	Chemicals	Singapore
SHANGHAI ASIA HOLDINGS LTD	October 1, 2004	General Retailers	Singapore
SHANGHAI TURBO ENTERPRISES LTD	January 16, 2006	Industrial Engineering	Cayman Islands
SIHUAN PHARMA HLDGS GROUP LTD	March 23, 2007	Pharmaceuticals	China
SINO TECHFIBRE LIMITED	October 20, 2006	Chemicals	Bermuda
SINOBEST TECHNOLOGY HOLDINGS LTD	November 18, 2004	Media	Bermuda
SINO-ENVIRONMENT TECH GRP LTD	April 28, 2006	Environmental Products & Service	Singapore
SINOMEM TECHNOLOGY LTD	June 18, 2003	Industrial Supplier	Singapore
SINOPIPE HOLDINGS LTD	December 16, 2005	IndustrialSupplier	Singapore
SINOSTAR PEC HOLDINGS LTD	September 26, 2007	Industrial Supplier	Singapore
SINOTEL TECHNOLOGIES LTD	November 12, 2007	Software and Computer Service	Singapore
SKY CHINA PETROLEUM SVCS LTD	November 10, 2005	Industrial Supplier	Singapore
SOUTHERN PACKAGING GROUP LTD	November 12, 2004	Industrial Engineering	Singapore
SP CHEMICALS LTD	August 6, 2003	Chemicals	Singapore
STAR PHARMACEUTICAL LTD	February 15, 2005	Pharmaceuticals	Singapore
STRACO CORPORATION LTD	February 20, 2004	Travel and Leisure	Singapore
SUNMART HOLDINGS LIMITED	August 15, 2007	Industrial Supplier	Singapore
SUNPOWER GROUP LTD	March 16, 2005	Environmental Products & Service	Bermuda
SUNRAY HOLDINGS LTD	November 5, 2003	Pharmaceuticals	Bermuda
SUNSHINE HOLDINGS LIMITED	March 31, 2006	Real Estate	Cayman Islands
SUNVIC CHEMICAL HOLDINGS LTD	February 5, 2007	Chemicals	Singapore
SYNEAR FOOD HOLDINGS LIMITED	August 18, 2006	Food Products	Bermuda
TIANJIN ZHONG XIN PHARMACEUTICAL	June 27, 1997	Pharmaceuticals	China
UNIONMET SINGAPORE LIMITED	January 31, 2007	Chemicals	Singapore
UNITED ENVIROTECH LTD	April 22, 2004	Environmental Products & Service	Singapore
UNITED FOOD HOLDINGS LTD	March 26, 2001	Food Products	Bermuda
WANXIANG INTERNATIONAL LIMITED	July 19, 2007	Food Products	Singapore
YAAN SECURITY TECHNOLOGY LTD	March 26, 2001	Electronic Equipment	Singapore
YANGZIJIANG SHIPBLDG HLDGS LTD	April 18, 2007	Industrial Transportation	Singapore
YANLORD LAND GROUP LIMITED	June 22, 2006	Real Estate	Singapore
YONGMAO HOLDINGS LIMITED	February 21, 2008	Industrial Machinery	Singapore
YONGXIN INTL HOLDINGS LTD	July 31, 2007	Industrial Supplier	Singapore
YOUCAN FOODS INTERNATIONAL LTD	November 22, 2004	Food Products	Singapore
ZHONGGUO JILONG LTD	September 30, 2004	Food Products	Singapore
ZHONGHUI HOLDINGS LTD	October 29, 2004	Environmental Products & Service	Singapore
Z-OBEE HOLDINGS LIMITED	November 21, 2007	Telecommunications Equipment	Bermuda

Sources: The Stock Exchange of Singapore, by 30 April, 2009

Appendix 1.8: Chinese Firms Listed on London Stock Exchange (AIM)

London AIM			
Name	**Listing Date**	**Industry**	**Country of Incorporation**
ARC CAPITAL HLDGS LTD	26-Jun-06	Equity Investment Instruments	Cayman Islands
ARKO HLDGS PLC	13-May-02	Electricity	UK
ASIAN CITRUS HLDGS	03-Aug-05	Farming & Fishing	Bermuda
ASIAN GROWTH PROPERTIES	05-Oct-06	Real Estate Holding & Development	British Virgin Islands
BLUESTAR SECUTECH INC	18-Jun-07	Electronic Equipment	British Virgin Islands
BODISEN BIOTECH INC	06-Feb-06	Specialty Chemicals	USA
CENTRAL CHINA GOLDFIELDS	30-Mar-05	Gold Mining	UK
CHINA BIODIESEL INTL HLDG CO LTD	30-Jun-06	Specialty Chemicals	British Virgin Islands
CHINA CENTRAL PROPERTIES LTD	13-Jun-07	Real Estate Holding & Development	UK
CHINA EASTSEA BUSINESS SOFTWARE	24-Jan-08	Software	UK
CHINA FOOD COMPANY PLC	10-Dec-07	Farming & Fishing	UK
CHINA GOLDMINES	07-Feb-06	Gold Mining	UK
CHINA GROWTH OPPORTUNITIES LTD	15-Mar-06	Equity Investment Instruments	UK
CHINA MEDICAL SYSTEM HLDGS LTD	26-Jun-07	Pharmaceuticals	Cayman Islands
CHINA REAL ESTATE OPPORTUNITIES PLC	11-Jul-07	Real Estate Holding & Development	UK
CHINA SHOTO	06-Dec-05	Electrical Components & Equipment	UK
CHINA WESTERN INVESTMENTS PLC	15-Jun-04	Real Estate Holding & Development	UK
CHINA WONDER	01-Oct-04	Industrial Machinery	UK
ET-CHINA.COM INTL HLDGS LTD	03-Aug-07	Travel & Tourism	UK
FOAMASTERS INTERNATIONAL LTD	05-Dec-07	Commodity Chemicals	UK
GEONG INTERNATIONAL	23-Jun-06	Software	UK
GMO LTD	06-Sep-06	Mobile Telecommunications	UK
GREEN DRAGON GAS LTD	17-Aug-06	Coal	Cayman Islands
GRIFFIN MINING	30-Jun-97	General Mining	Bermuda
HAIKE CHEMICAL GROUP LTD	14-Feb-07	Exploration & Production	Cayman Islands
HUTCHISON CHINA MEDITECH	19-May-06	Pharmaceuticals	Cayman Islands
JARLWAY HOLDINGS PLC	18-Jul-05	Industrial Machinery	UK
JETION HLDGS LTD	06-Jul-07	Electrical Components & Equipment	British Virgin Islands
LED INTL HLDGS LTD	23-Oct-06	Electronic Equipment	Hong Kong
LEYSHON RESOURCES	26-Oct-05	Gold Mining	Australia
MACAU PROPERTY OPPORTUNITIES FUND	05-Jun-06	Real Estate Holding & Development	UK
NATSUN HLDGS LTD	24-Dec-07	Clothing & Accessories	Hong Kong
NETDIMENSIONS(HLDGS)LTD	02-May-07	Software	Cayman Islands
ORIGO RESOURCES PARTNERS LTD	14-Dec-07	Equity Investment Instruments	UK
ORIGO SINO-INDIA PLC	21-Dec-06	Specialty Finance	UK
PACIFIC ALLIANCE ASIA OPPORTUNTY FD	21-Sep-06	Equity Investment Instruments	Cayman Islands
PACIFIC ALLIANCE CHINA LAND LTD	22-Nov-07	Real Estate Holding & Development	Cayman Islands
PAQ INTERNATIONAL HLDGS LTD	25-Feb-08	Industrial Suppliers	Cayman Islands
PIXEL INTERACTIVE MEDIA LTD	10-Jul-06	Media Agencies	UK
PROSPERITY MINERALS HLDGS	24-May-06	Building Materials & Fixtures	UK
RCG HLDGS LTD	02-Jul-04	Electronic Equipment	Bermuda
RENESOLA LTD	08-Aug-06	Electrical Components & Equipment	British Virgin Islands
SINOSOFT TECHNOLOGY PLC	06-Mar-06	Software	UK
SORBIC INTL PLC	30-Sep-08	Food Products	UK
SOVGEM	23-Nov-04	Specialty Finance	UK
SPEYMILL MACAU PROPERTY CO PLC	17-Nov-06	Real Estate Holding & Development	UK
SWEET CHINA PLC	31-Mar-05	Food Products	UK
TAIHUA PLC	14-Dec-06	Biotechnology	UK
TINCI HOLDINGS	31-Jul-06	Industrial Machinery	Hong Kong
UNIVISION ENGINEERING	16-Dec-05	Electronic Equipment	Hong Kong
UPSTREAM MARKETING & COMMS INC	16-Oct-06	Media Agencies	Cayman Islands
VISION OPPORTUNITY CHINA FUND LTD	28-Nov-07	Equity Investment Instruments	UK
WALCOM GROUP LTD	21-Dec-06	Food Products	British Virgin Islands
WEST CHINA CEMENT LTD	04-Dec-06	Building Materials & Fixtures	UK
YANGTZE CHINA INVESTMENT LTD	14-May-08	Equity Investment Instruments	Cayman Islands
ZTC TELECOMMUNICATIONS PLC	21-Mar-07	Telecommunications Equipment	UK

Sources: London Stock Exchange AIM, by 30 April, 2009

Appendix 2: Chinese Dual and Triple Cross-listing Information

Appendix 2.1: Chinese Firms Dual-Listed on China A and B Market

COMPANY NAME	China A	China B	Industry
ANHUI GUJING DISTILLERY COMPANY LIMITED	27/09/1996	12/06/1996	Beverages
BENGANG STEEL PLATES COMPANY LIMITED	15/01/1998	8/07/1997	Industrial Metals & Mining
BOE TECHNOLOGY GROUP COMPANY LIMITED	12/01/2001	10/01/1997	Technology Hardware & Equipment
CHANGCHAI COMPANY LIMITED	1/07/1994	13/09/1996	Industrial Engineering
CHINA FANGDA GROUP COMPANY LIMITED	15/04/1996	4/03/1996	Construction & Materials
CHINA FIRST PENCIL COMPANY LIMITED	14/08/1992	28/07/1992	Personal Goods
CHINA INTERNATIONAL MARINE CONTAINERS GROUP CO LIMITED	8/04/1994	23/03/1994	General Industrials
CHINA MERCHANTS PROPERTY DEVELOPMENT COMPANY LIMITED	7/06/1993	7/06/1993	Real Estate Investment & Service
CHINA TEXTILE MACHINERY COMPANY LIMITED	5/08/1992	28/07/1992	Industrial Engineering
CHINA VANKE CO LIMITED	26/08/1991	28/05/1991	Real Estate Investment & Service
CHONGQING CHANGAN AUTOMOBILE CO LIMITED	10/06/1997	8/11/1996	Automobiles & Parts
CSG HOLDING COMPANY LIMITED	28/02/1992	28/02/1992	Construction & Materials
DALIAN REFRIGERATION COMPANY LIMITED	8/12/1993	20/03/1998	Industrial Engineering
DANHUA CHEMICAL TECHNOLOGY CO.LTD	11/03/1994	29/12/1993	Chemicals
DAZHONG TRANSPORTATION (GROUP) COMPANY LIMITED	7/08/1992	22/07/1992	Travel & Leisure
DOUBLE COIN HOLDINGS LTD.	4/12/1992	28/08/1992	Automobiles & Parts
EASTERN COMMUNICATIONS COMPANY LIMITED	26/11/1996	9/08/1996	Technology Hardware & Equipment
FOSHAN ELECTRICAL AND LIGHTING COMPANY LIMITED	23/11/1993	8/08/1995	Household Goods & Home Construction
GUANGDONG ELECTRIC POWER DEVELOPMENT COMPANY LIMITED	26/11/1993	28/06/1995	Electricity
GUANGDONG PROVINCIAL EXPRESSWAY DEVELOPMENT COMPANY LIMI	20/02/1998	15/08/1996	Industrial Transportation
GUANGDONG SUNRISE HOLDINGS COMPANY LIMITED	4/10/1993	5/10/1993	Support Services
HAINAN AIRLINES COMPANY LIMITED	25/11/1999	27/06/1997	Travel & Leisure
HAINAN DADONGHAI TOURISM CENTRE (HOLDING) COMPANY LIMITED	28/01/1997	8/10/1996	Travel & Leisure
HAINAN PEARL RIVER HOLDINGS COMPANY LTD	21/12/1992	30/06/1995	Real Estate Investment & Service
HEFEI MEILING COMPANY LIMITED	18/10/1993	28/08/1996	Household Goods & Home Construction
HUADIAN ENERGY COMPANY LIMITED	1/07/1996	22/04/1996	Electricity
HUANGSHAN TOURISM DEVELOPMENT COMPANY LIMITED	6/05/1997	22/11/1996	Travel & Leisure
HUAXIN CEMENT COMPANY LIMITED	3/01/1994	9/12/1994	Construction & Materials
INNER MONGNIA EERDUOSI CASHMERE	26/04/2001	20/10/1995	Personal Goods
JIANGLING MOTORS CORPORATION LIMITED	1/12/1993	29/09/1995	Automobiles & Parts
JINAN QINGQI MOTORCYCLES	6/12/1993	17/06/1997	Automobiles & Parts
JINSHAN DEVELOPMENT & CONSTRUCTION CO LTD	8/10/1993	19/11/1993	Leisure Goods
JINZHOU PORT COMPANY LIMITED	9/06/1999	19/05/1998	Industrial Transportation
KONKA GROUP COMPANY LIMITED	27/03/1992	27/03/1992	Leisure Goods
LIVZON PHARMACEUTICAL GROUP INCORPORATED	28/10/1993	20/07/1993	Pharmaceuticals & Biotechnolog
LUTHAI TEXTILE COMPANY LIMITED	25/12/2000	19/08/1997	Personal Goods
SGSB GROUP COMPANY LIMITED	11/03/1994	18/01/1994	Industrial Engineering
SHANDONG CHENMING PAPER HOLDINGS LIMITED	20/11/2000	26/05/1997	Forestry & Paper
SHANGHIA CHLOR-ALKALI CHM	13/11/1992	20/08/1992	Chemicals
SHANGHAI BAOSIGHT SOFTWARE COMPANY LIMITED	11/03/1994	16/03/1996	Software & Computer Services
SHANGHAI DIESEL ENGINE COMPANY LIMITED	11/03/1994	29/12/1993	Industrial Engineering
SHANGHAI DINGLI TECHNOLOGY DEVELOPMENT (GROUP) CO.LTD	28/08/1992	28/07/1992	Pharmaceuticals & Biotechnology
SHANGHAI ERFANGJI COMPANY LIMITED	10/04/1992	1/07/1992	Industrial Engineering
SHANGHAI FRIENDSHIP GROUP INCORPORATED COMPANY	4/02/1994	5/01/1994	General Retailers
SHANGHAI HAIXIN GROUP COMPANY LIMITED	4/04/1994	9/12/1993	Personal Goods
SHANGHAI HIGHLY GROUP COMPANY LIMITED	16/11/1992	18/01/1993	Industrial Engineering
SHANGHAI JIN JIANG INTERNATIONAL INDUSTRIAL INVESTMENT COMPAI	7/06/1993	18/10/1993	Industrial Transportation
SHANGHAI LUJIAZUI FINANCE & TRADE ZONE DEVELOPMENT CO., LTD.	28/06/1993	22/11/1994	Real Estate Investment & Service
SHANGHAI POTEVIO COMPANY LIMITED	18/10/1993	20/10/1994	Technology Hardware & Equipment
SHANGHAI SANMAO ENTERPRISE (GROUP) COMPANY LIMITED	8/11/1993	3/01/1994	Personal Goods
SHANGHAI WINGSUNG DATA TECHNOLOGY COMPANY LIMITED	20/08/1992	22/07/1992	Pharmaceuticals & Biotechnology
SHANGHAI YAOHUA PILKINGTON GLASS COMPANY LIMITED	28/01/1994	13/12/1993	Construction & Materials
SHANGHAI ZHENHUA PORT MACHINERY (GROUP) COMPANY LIMITED	21/12/2000	5/08/1997	Industrial Engineering
SHANGHAI AUTOMATION INSTRUMENTATION COMPANY LIMITED	24/03/1994	29/04/1994	Electronic & Electrical Equipment
SHANGHAI DAJIANG (GROUP) STOCK COMPANY LIMITED	22/11/1993	16/12/1993	Food Producers
SHANGHAI JINJIANG INTERNATIONAL HOTELS DEVELOPMENT COMPANY	11/10/1996	15/12/1994	Travel & Leisure
SHANGHAI JINQIAO EXPORT PROCESSING ZONE DEVELOPMENT COMPAN'	26/03/1993	31/03/1993	Real Estate Investment & Service
SHANGHAI KAIKAI INDUSTRIAL CO LTD	28/02/2001	8/01/1997	Personal Goods
SHANGHAI MECHANICAL & ELECTRICAL INDUSTRY COMPANY LIMITED	24/02/1994	31/01/1994	Industrial Engineering
SHANGHAI MRA TRDG	4/02/1994	30/01/1994	Industrial Metals & Mining
SHANGHAI NINE DRAGON	28/03/2001	18/01/1999	Personal Goods
SHENZHEN PROPERTIES & RESOURCES DEVELOPMENT (GROUP) LIMITED	30/03/1992	30/03/1992	Real Estate Investment & Service
SHENZHEN SEG CO LTD	26/12/1996	22/07/1996	Electronic & Electrical Equipment
SHENZHEN SPECIAL ECONOMIC ZONE REAL ESTATE AND PROPERTIES (GI	15/09/1993	10/01/1994	Real Estate Investment & Service
SHENZHEN TEXTILE (HOLDINGS) COMPANY LIMITED	15/08/1994	15/08/1994	Personal Goods
SHENZHEN ACCORD PHARMACEUTICAL COMPANY LIMITED	9/08/1993	10/08/1993	Pharmaceuticals & Biotechnology
SHENZHEN INTERNATIONAL ENTERPRISE COMPANY LIMITED	6/08/1996	13/12/1995	General Retailers
SHENZHEN NANSHAN POWER STATION COMPANY LIMITED	1/07/1994	28/11/1994	Electricity
SHENZHEN SHENBAO INDUSTRIAL COMPANY LIMITED	12/10/1992	2/01/1991	Beverages
SHENZHEN TELLUS (HOLDINGS) COMPANY LIMITED	21/06/1993	21/06/1993	General Retailers
SHENZHEN VICTOR ONWARD TEXTILE INDUSTRIAL COMPANY LIMITED	16/06/1992	16/06/1992	Personal Goods
SHENZHEN ZHONGHENG HUAFA CO., LIMITED.	28/04/1992	28/04/1992	Electronic & Electrical Equipmect
SHIJIAZHUANG BAOSHI ELECTRONIC GLASS COMPANY LIMITED	25/09/1996	8/07/1996	Electronic & Electrical Equipment
SVA ELECTRON COMPANY LIMITED	2/01/1991	21/02/1992	Electronic & Electrical Equipment
WEIFU HIGH-TECHNOLOGY COMPANY LIMITED	24/09/1998	11/09/1995	Automobiles & Parts
WUXI LITTLE SWAN CO LIMITED	28/03/1997	18/07/1996	Household Goods & Home Construction
YANTAI CHANGYU PIONEER WINE COMPANY LIMITED	26/10/2000	23/09/1997	Beverages
ZHONGLU COMPANY LIMITED	28/01/1994	15/11/1993	Leisure Goods

Appendix 2.2: Chinese Firms Dual-Listed on China A and Hong Kong Market

Company Name	Listing Date		Industry
	Hong Kong	China A	
ANHUI CONCH CEMENT	21/10/1997	7/02/2002	Construction & Materials
ANHUI EXPRESSWAY	13/11/1996	7/01/2003	Industrial Transportation
BANK OF CHINA	1/06/2006	5/07/2006	Banks
BANK OF COMMUNICATIONS	23/06/2005	15/05/2007	Banks
BEIJING NORTH STAR	14/05/1997	16/10/2006	Real Estate Investment & Services
BEIREN PRINTING MACHINERY	06/08/1993	06/05/1994	Industrial Engineering
CHINA CITIC BANK CORPORATION LIMITED	27/04/2007	27/04/2007	Banks
CHINA COAL ENERGY COMPANY LTD	19/12/2006	1/02/2008	Mining
CHINA CONSTRUCTION BANK CORP	27/10/2005	25/09/2007	Banks
CHINA COSCO HOLDINGS COMPANY LIMITED	30/06/2005	26/06/2007	Industrial Transportation
CHINA MERCHANTS BANK CO LTD	22/09/2006	9/04/2002	Banks
CHINA MOBILE	15/11/2002	14/11/2002	Telecommunications
CHINA RAILWAY GROUP	7/12/2007	3/12/2007	Construction & Materials
CHINA SHENHUA ENERGY	15/01/2005	9/10/2007	Mining
CHINA TELECOM CORP LTD	23/10/1997	22/10/1997	Fixed Line Telecommunications
CHONGQING IRON AND STEEL	17/10/1997	28/02/2007	Industrial Metals & Mining
DONGFANG ELECTRIC CORPORATION LIMITED	06/06/1994	18/10/1995	Industrial Engineering
GUANGZHOU SHIPYARD INTERNATIONAL	6/08/1993	28/10/1993	Industrial Engineering
HISENSE KELON ELECT.	13/07/1999	23/07/1996	Electronic & Electrical Equipment
HUADIAN POWER INTERNATIONAL	30/06/1999	3/02/2005	Electricity
INDUSTRIAL & COMMERCIAL BANK OF CHINA LTD	27/10/2006	27/10/2006	Banks
JINGWEI TEXTILE MACHINERY	02/02/1996	10/12/1996	Industrial Engineering
MAANSHAN IRON & STEEL COMPANY	03/11/1993	06/01/1994	Industrial Metals & Mining
NANJING PANDA ELECTRONICS COMPANY	02/05/1996	18/11/1996	Technology Hardware & Equipment
NORTHEAST ELECTRIC DEVELOPMENT COMPANY	06/07/1995	13/12/1995	Electronic & Electrical Equipment
SHANDONG CHENMING PAPER HOLDINGS	18/06/2008	20/11/2000	Forestry & Paper
SHANDONG XINHUA PHARMACEUTICAL	31/12/1996	08/08/1997	Pharmaceuticals & Biotechnology
SHANGHAI ELECTRIC GROUP	28/04/2005	5/12/2008	Industrial Engineering
SHENJI GROUP KUNMING MACHINE TOOL	7/12/1993	3/01/1994	Industrial Engineering
SINOPEC YIZHENG CHEMICAL FIBRE	29/03/1994	11/04/1995	Chemicals
WEICHAI POWER CO., LTD.	11/03/2004	30/04/2007	Industrial Engineering
ZIJIN MINING	25/04/2008	23/12/2003	Mining
ZTE CORP	9/12/2004	18/11/1997	Technology Hardware & Equipment

Sources: New York Stock Exchange Website, Hong Kong Stock Exchnage Website on April 2009

Appendix 2.3: Chinese Firms Triple-Listed on China A, Hong Kong, and USA Market

Company Name	Listing Date			Industry
	Hong Kong	New York (ADR)	China A	
ALUMINUM CORPORATION OF CHINA LIMITED	12/12/2001	11/12/2001	30/04/2007	Industrial Metals & Mining
CHINA EASTERN AIRLINES CORPORATION LIMITED	5/02/1997	4/02/1997	5/11/1997	Travel & Leisure
CHINA LIFE INSURANCE CO LTD	17/12/2003	18/12/2003	9/01/2007	Life Insurance
CHINA NETCOM GROUP	16/11/2004	16/12/2004	16/12/2004	Fixed Line Telecommunications
CHINA PETROLEUM & CHEMICAL CORPORATION	19/10/2000	18/10/2000	8/08/2001	Oil & Gas Producers
CHINA SOUTHERN AIRLINES COMPANY LIMITED	31/07/1997	30/17/1997	25/07/2003	Travel & Leisure
CHINA UNITED TELECOMMUNICATION	22/06/2000	21/06/2000	9/10/2002	Wireless Communication
GUANGSHEN RAILWAY COMPANY LIMITED	14/05/1996	13/05/1996	22/09/2003	Travel & Leisure
HUANENG POWER INTERNATIONAL INCORPORATED	21/01/1998	6/10/1994	6/12/2001	Electricity
PETROCHINA CO LTD	7/04/2000	6/04/2000	5/11/2007	Oil & Gas Producers
SINOPEC SHANGHAI PETROCHEMICAL COMPANY LIMITED	26/07/1993	26/07/1993	8/11/1993	Chemicals
YANZHOU COAL MINING COMPANY	1/04/1998	31/03/1998	1/07/1998	Mining
CHINA TELECOM CORP LTD	23/10/1997	22/10/1997		Fixed Line Telecommunications
CHINA MOBILE	15/11/2002	14/11/2002		Wireless Communication
CNOOC-CHINA NATIONAL OFFSHORE OIL	28/02/2001	27/02/2001		Energy
	Hong Kong	**OTC US (ADR)**	**China A**	
AIR CHINA LIMITED	15/12/2004	24/08/2006	18/08/2006	Travel & Leisure
ANGANG STEEL COMPANY LIMITED	24/07/1997	13/10/2003	26/12/1997	Industrial Metals & Mining
CHINA OILFIELD SERVICES	20/11/2002	8/02/2005	28/09/2007	Oil Equipment & Services
CHINA RAILWAY CONSTRUCTION CORPORATION	13/03/2008	10/07/2008	103/2008	Construction & Materials
CHINA SHIPPING DEVELOPMENT COMPANY LIMITED	11/11/1994	2/02/2006	23/05/2002	Industrial Transportation
CHINA SHIPPING CONTAINER LINES	16/06/2004	23/07/2004	12/12/2007	Industrial Transportation
DATANG INTERNATIONAL POWER GENERATION COMPANY LIM	21/03/1997	19/08/2003	20/12/2006	Electricity
GUANGZHOU PHARMACEUTICAL CO., LTD.	30/10/1997	8/03/2007	6/02/2001	Pharmaceuticals & Biotechnolog
JIANGSU EXPRESSWAY COMPANY LIMITED	27/06/1997	27/08/2003	22/09/2003	Industrial Transportation
JIANGXI COPPER COMPANY LIMITED	12/06/1997	10/11/2003	16/07/2002	Industrial Metals & Mining
PING AN INSURANCE (GROUP) COMPANY OF CHINA LTD	24/06/2004	10/02/2006	1/03/2007	Life Insurance
TIANJIN CAPITAL ENVIRONMENTAL PROTECTION GROUP COMI	17/05/1994	16/12/2005	30/06/1995	Gas, Water & Multiutilities
TSINGTAO BREWERY COMPANY LIMITED	15/07/1993	15/07/1993	27/08/1993	Beverages
ZHEJIANG EXPRESSWAY COMPANY LIMITED	15/05/1997	22/09/2006	12/08/2005	Industrial Transportation
HOPEWELL HIGHWAY INFRASTRUCTURE	6/08/2003	21/01/2005		Industrial Transportation
BRILLANCE CHINA AUTOMOTIVE	22/10/1999	9/10/1992		Auto Manufacturers
CHINA NETCOM GROUP	16/11/2004	16/12/2004		Wireless Communication

Sources: Hong Kong Stock Exchange Website, Shanghai and Shenzhen Stock Exchange Websites, New York Stock Exchange Website, Datastream on April 20

Appendix 3: Distribution of Realised Return

Appendix 3.1: Descriptive Statistics on Returns of Dual-Listing Chinese Firms Traded on China A and B Markets for the Period 01/01/1993 to 31/12/2008

Company	Market	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Observations
Anhui Guijing Distiller	A	0.0001	0.1823	-0.1447	0.0290	0.1908	6.7010	1888.9570	3275
	B	-0.0003	0.1395	-0.3035	0.0276	-0.3362	10.5939	7744.5150	3198
Bengang Steel Plate	A	-0.0001	0.0961	-0.2297	0.0257	-0.1222	8.2579	3300.3300	2859
	B	0.0002	0.0997	-0.1072	0.0278	0.1866	6.0972	1214.8880	2996
BOE Technology	A	-0.0005	0.0970	-0.2901	0.0325	-0.7454	9.8899	4302.5850	2078
	B	0.0001	0.2231	-0.1077	0.0331	0.1247	5.3072	676.7362	3016
Changchai Company	A	0.0002	0.3403	-0.3173	0.0328	0.5335	15.3046	24044.4700	3783
	B	-0.0003	0.1368	-0.1799	0.0309	0.0169	5.6384	930.6340	3208
China Fanda	A	0.0000	0.1715	-0.2415	0.0320	-0.1778	6.5207	1730.6080	3317
	B	0.0004	0.2123	-0.1991	0.0331	0.0492	6.1045	1345.4650	3347
China First Pencil	A	0.0003	0.3468	-0.2112	0.0322	0.7780	11.8996	14192.2600	4173
	B	0.0005	0.7348	-0.2876	0.0334	2.5456	63.4383	639635.4000	4173
China Interational Marine Cont	A	0.0006	0.2754	-0.1696	0.0280	0.5941	11.1176	10777.4400	3843
	B	0.0007	0.1351	-0.1456	0.0276	-0.0546	6.9696	2532.9910	3855
China Merchants Propert Devel	A	0.0006	0.1753	-0.2456	0.0303	0.0585	7.7753	3861.7730	4062
	B	0.0003	0.4381	-0.1811	0.0317	0.9723	16.8644	33173.2000	4062
China Textile Machinery	A	0.0000	0.3552	-0.2545	0.0336	0.6232	11.5019	12838.3100	4173
	B	-0.0001	0.2830	-0.3117	0.0329	0.0886	10.7246	10380.3600	4173
China Vanke	A	0.0007	0.2583	-0.2007	0.0290	0.4674	9.3527	7168.8850	4173
	B	0.0008	0.4021	-0.3540	0.0331	0.4785	17.6692	36629.2600	4068
Congqing Changan Automobile	A	0.0003	0.2830	-0.2136	0.0343	0.2654	6.6026	1750.4100	3168
	B	-0.0001	0.0962	-0.1459	0.0277	-0.0688	5.6350	874.9430	3016
CSG Holding	A	0.0003	0.4061	-0.1947	0.0329	0.6516	11.5880	13119.0900	4173
	B	0.0003	0.1674	-0.2412	0.0302	-0.1634	7.6768	3821.6200	4173
Dalian Referigerator	A	0.0001	0.1552	-0.1109	0.0279	0.0773	6.6647	1576.9080	2813
	B	0.0001	0.2998	-0.2350	0.0305	0.5401	12.7417	15730.9100	3930
Danhua chemical	A	0.0002	0.8261	-0.2113	0.0355	4.2717	88.9815	1201684.0000	3863
	B	0.0002	0.7068	-0.1612	0.0324	2.5735	62.0450	573025.4000	3915
Dazhong Transportation	A	0.0005	0.3248	-0.2777	0.0316	0.6425	13.2925	18706.4600	4173
	B	0.0005	0.2956	-0.2553	0.0310	0.1628	9.4578	7269.6560	4173
Double Coin	A	-0.0003	0.3083	-0.2239	0.0336	0.4447	10.3789	9604.6960	4173
	B	-0.0001	0.3412	-0.1774	0.0331	0.3648	8.1210	4652.3170	4173
Eastern Communications	A	-0.0002	0.0968	-0.3003	0.0301	-0.2912	8.1583	3543.5180	3156
	B	0.0002	0.6423	-0.1070	0.0330	2.3471	48.8534	286196.9000	3233
Foshan Electrical	A	0.0002	0.2202	-0.2555	0.0258	0.0395	14.3610	21195.6000	3941
	B	0.0005	0.1600	-0.1542	0.0247	0.1216	8.7072	4753.3390	3496
Guangdong Electric Power	A	0.0003	0.1780	-0.1823	0.0263	0.0839	7.9028	3534.6630	3525
	B	0.0003	0.2089	-0.2060	0.0263	0.0497	9.3107	6536.1720	3938
Guangdong Provincial Express	A	-0.0001	0.0961	-0.2398	0.0226	-0.5109	11.8942	9461.2300	2833
	B	0.0002	0.1665	-0.1823	0.0277	0.0193	7.8326	3142.2430	3229
Guandgong Sunrise	A	-0.0003	0.4979	-0.4923	0.0352	0.5543	31.5800	135523.2000	3976
	B	-0.0004	0.4287	-0.2429	0.0314	1.1421	21.6342	58404.3200	3977
Hainan Airlines	A	-0.0002	0.0967	-0.1660	0.0289	-0.0692	6.1434	979.3089	2374
	B	-0.0001	0.0980	-0.1059	0.0327	-0.0030	5.2431	629.5775	3003
Hainan Dadonghai Tourism	A	-0.0001	0.2666	-0.2531	0.0317	0.0207	9.3359	5337.6860	3191
	B	-0.0006	0.6825	-0.2624	0.0299	3.2786	94.6433	1094228.0000	3111
Hainan Pearl River Holdings	A	0.0000	0.7885	-0.6931	0.0419	0.6715	72.0644	700444.3000	3523
	B	-0.0001	0.3006	-0.2026	0.0346	0.3464	7.7521	3771.7350	3925
Hefei Meiling	A	-0.0001	0.2625	-0.2473	0.0305	0.2428	10.7995	10094.0100	3967
	B	-0.0001	0.2016	-0.1687	0.0328	0.0831	5.7680	1031.6510	3220
Huadian Energy	A	-0.0001	0.1335	-0.2646	0.0255	-0.4116	9.6728	6144.0130	3262
	B	0.0003	0.1682	-0.1725	0.0293	0.1063	6.7894	1987.8440	3312
Huangshan Tourism	A	0.0006	0.1771	-0.1124	0.0299	-0.0208	6.1343	1292.8450	3158
	B	0.0001	0.0958	-0.3028	0.0251	-0.6062	12.5405	11719.3300	3041
Huaxin Cement	A	0.0002	0.3184	-0.2089	0.0325	0.6190	11.0006	10683.4500	3912
	B	0.0007	0.2893	-0.1510	0.0335	0.1915	6.8875	2332.1480	3668
Inner Mongolia Eerduosica	A	0.0005	0.2791	-0.1505	0.0306	0.3103	8.0900	3771.9580	3443
	B	-0.0001	0.0961	-0.1057	0.0282	-0.0976	5.8060	660.6289	2004
Jiangling Motors	A	0.0001	0.3478	-0.2005	0.0326	0.8901	13.2726	17821.6300	3935
	B	0.0004	0.2113	-0.2179	0.0311	0.0887	7.6507	3120.8630	3458
Jinan Qingqi Motorcycle	A	-0.0001	0.2851	-0.5595	0.0299	-1.0835	40.7621	234392.3000	3932
	B	-0.0003	0.0977	-0.1340	0.0285	-0.0196	4.7856	400.2060	3011
Jinshan Development	A	0.0000	0.2625	-0.1970	0.0349	0.1448	6.6701	2226.7020	3943
	B	-0.0001	0.2969	-0.3279	0.0347	0.2820	11.8304	12961.0100	3973

A represents shares listed in China A-share market, B represents shares listed in China B-share market

(cont.)

Company	Market	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Observations
Jinzhou Port	A	-0.0001	0.0964	-0.1181	0.0270	-0.2233	5.7771	822.4733	2495
	B	0.0003	0.1221	-0.1060	0.0291	0.0201	5.8844	960.7502	2771
Konka Group	A	0.0001	0.2937	-0.2093	0.0276	0.2253	10.4999	9815.3870	4173
	B	0.0001	0.2373	-0.2585	0.0279	0.0673	10.0265	8587.5480	4173
Livzon Pharmaceutical	A	0.0004	0.4075	-0.1745	0.0310	1.0926	18.5535	40692.8200	3959
	B	0.0005	0.2503	-0.2045	0.0312	0.2996	9.7664	7750.2440	4031
Luthai Textile	A	0.0003	0.0958	-0.1057	0.0262	-0.0582	7.1233	1483.1230	2092
	B	0.0008	0.0989	-0.1060	0.0282	0.1802	6.1876	1271.7440	2966
SGSB Group	A	-0.0002	0.3509	-0.5266	0.0354	-0.4165	21.4123	54678.8500	3863
	B	-0.0001	0.3622	-0.2674	0.0337	0.1778	12.5379	14807.2500	3901
Shanghai Baosight	A	0.0006	1.3293	-0.2928	0.0395	9.7640	336.7198	17973168.000	3860
	B	0.0001	0.4395	-0.3199	0.0342	0.9863	19.3238	43516.3500	3863
Shanghai Chlor-Alkali	A	0.0001	0.5653	-0.1823	0.0327	1.3335	26.8965	100526.6000	4173
	B	-0.0002	0.3271	-0.2066	0.0339	0.6787	11.3762	12519.4900	4173
Shanghai Dingli Technology	B	0.0002	0.2344	-0.2875	0.0331	-0.3576	11.2281	11860.4000	4173
	A	0.0001	0.3464	-0.4531	0.0346	0.0257	16.1450	30044.3200	4173
Shanghai Erfangji	B	-0.0003	0.2630	-0.3846	0.0347	0.0913	11.3270	12062.2100	4173
	A	-0.0001	0.3343	-0.2412	0.0342	0.4085	9.1359	6662.2140	4173
Shanghai Friendship	B	0.0004	0.1444	-0.1213	0.0285	0.1535	6.2253	1710.0970	3910
	A	0.0003	0.4487	-0.2238	0.0313	1.3896	23.5651	69764.8600	3888
Shanghai Haixin Group	B	0.0001	0.2580	-0.1746	0.0300	0.3389	9.8814	7664.0480	3847
	A	0.0004	0.3834	-0.3102	0.0335	0.3653	16.4999	29922.9200	3929
Shanghai Highly Group	B	0.0000	0.2923	-0.2840	0.0328	0.3564	11.4664	12551.6500	4173
	A	0.0003	0.5960	-0.1635	0.0324	1.5039	32.6756	154287.2000	4162
Shanghai Jinjiang International	B	0.0004	0.4897	-0.2775	0.0310	1.0937	24.2994	75777.5300	3967
	A	-0.0001	0.4109	-0.2683	0.0315	1.0865	20.2779	51324.9000	4062
Shanghai Lujiazui Finance & Tı	A	0.0003	0.1365	-0.1065	0.0277	0.0724	6.4202	1797.3130	3681
	B	0.0002	0.3365	-0.1403	0.0297	1.0780	14.0271	21288.0000	4047
Shanghai Potevio	A	0.0000	0.3758	-0.3666	0.0324	0.3260	15.5919	26278.1600	3967
	B	0.0001	0.1502	-0.1846	0.0308	0.0490	6.2859	1667.8320	3704
Shanghai Sanmao	A	0.0002	0.6698	-0.3777	0.0344	1.4079	46.2973	306861.8000	3912
	B	0.0000	0.3610	-0.2591	0.0342	0.3968	10.9616	10541.4200	3952
Shanghai Wingsung	A	0.0000	0.5719	-0.5563	0.0362	0.3772	48.2775	356552.2000	4173
	B	-0.0001	0.1939	-0.3238	0.0328	-0.1788	8.4661	5217.3410	4173
Shanghai Yaohua Pilkington	A	-0.0001	0.1571	-0.1570	0.0303	-0.0435	6.4266	1922.4610	3927
	B	-0.0001	0.4104	-0.1895	0.0313	0.8191	15.5442	25959.9300	3893
Shanghai Zhenhua Port Machin	A	0.0008	0.0968	-0.1072	0.0318	0.0570	5.3134	665.2101	2976
	B	0.0007	0.0957	-0.1054	0.0265	-0.0127	5.5611	572.3609	2094
Shangdong Chenming Paper	A	0.0003	0.0968	-0.1245	0.0291	0.0183	5.8081	994.7049	3027
	B	-0.0001	0.0956	-0.1917	0.0262	-0.3473	7.4587	1796.1700	2117
Shanghai Automation Instrumer	A	0.0002	0.2406	-0.2405	0.0328	0.2615	7.4510	3203.4860	3828
	B	-0.0002	0.3435	-0.3815	0.0345	0.1334	13.7712	18642.1300	3854
Shanghai Diesel	A	-0.0001	0.2923	-0.2263	0.0319	0.5024	10.3455	8847.2680	3863
	B	0.0001	0.5734	-0.1221	0.0320	1.5198	31.2306	131512.6000	3915
Shanghai Jinjiang Hotel	A	0.0004	0.1400	-0.1376	0.0288	0.0527	6.0287	1402.1280	3664
	B	0.0001	0.0962	-0.1677	0.0273	-0.1268	5.8122	1059.0490	3188
Shanghai Jinqiao	A	0.0003	0.5527	-0.1395	0.0304	1.5298	32.1801	145876.5000	4067
	B	0.0002	0.3341	-0.1742	0.0318	0.9554	12.8304	17186.7600	4113
Shanghai Kaikai	A	-0.0005	1.2193	-0.1060	0.0420	11.9086	350.2323	10321927.0000	2045
	B	0.0001	0.0976	-0.1069	0.0324	-0.0182	5.3145	697.7103	3125
Shanghai Mechanic and Electric	A	0.0004	0.5148	-0.1647	0.0316	1.1287	23.7404	70584.8700	3892
	B	0.0003	0.2924	-0.3303	0.0322	0.4999	14.6197	21955.2500	3874
Shanghai MRA Trading	A	0.0002	0.2233	-0.2233	0.0310	0.2292	7.9399	3948.3080	3850
	B	-0.0001	0.3503	-0.2278	0.0327	0.5229	11.1369	10903.0200	3888
Shanghai Nine Dragon	A	-0.0006	0.0961	-0.3256	0.0311	-0.7503	10.6311	5103.4270	2025
	B	0.0005	0.0969	-0.1068	0.0299	0.2030	6.1428	1086.6250	2597
Shenzhen Nanshan Power	A	0.0003	0.3650	-0.2713	0.0304	0.5687	16.4125	28559.8900	3783
	B	0.0003	0.3830	-0.3330	0.0311	0.0715	18.0110	34525.7900	3677
Shenzhen Properties and Resou	A	-0.0002	0.3567	-0.4134	0.0342	0.0393	18.0516	39392.7300	4173
	B	-0.0002	0.2304	-0.2053	0.0308	0.3674	7.2357	3213.4580	4173

A represents shares listed in China A-share market, B represents shares listed in China B-share market

(cont.)

Company	Market	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Observations
Shenzhen SEG	A	-0.0003	0.2427	-0.3958	0.0296	-0.5602	15.8763	21814.4300	3134
	B	0.0000	0.2516	-0.2047	0.0316	0.2001	6.5886	1764.0040	3247
Shenzhen Special Economic Zo	A	-0.0003	0.2652	-0.1993	0.0336	0.3115	7.6595	3673.9480	3990
	B	-0.0002	0.2624	-0.2087	0.0336	0.1097	6.7075	2245.4470	3907
Shenzhen Textile	A	0.0001	0.3530	-0.3450	0.0331	0.2930	14.4584	20579.3200	3752
	B	0.0001	0.2292	-0.5008	0.0361	-0.8824	19.8892	45080.1200	3752
Shijianzhuang Baoshi	A	-0.0003	0.1290	-0.2813	0.0306	-0.2387	6.6874	1843.3540	3200
	B	-0.0001	0.1959	-0.1960	0.0318	0.1138	5.5438	885.2065	3257
Shenzhen Accord Pharmaceutic	A	0.0004	0.3629	-0.1613	0.0329	0.7909	10.9990	11128.0600	4017
	B	0.0005	0.3318	-0.3147	0.0346	0.1237	10.2277	8751.6810	4016
Shenzhen International Enterpri	A	0.0004	0.3409	-0.1919	0.0364	0.2274	8.1693	3820.5340	3405
	B	0.0000	0.1224	-0.1339	0.0330	-0.1857	4.8970	503.8301	3236
Shenzhen Shenbao Industrial	A	-0.0001	0.3219	-0.3814	0.0348	0.1838	11.6895	13152.2700	4173
	B	0.0000	0.3102	-0.3102	0.0380	0.2737	11.5979	12905.7100	4173
Shenzhen Tellus	A	-0.0002	0.3391	-0.2375	0.0358	0.3801	8.5928	5378.5800	4052
	B	-0.0001	0.8079	-0.7101	0.0410	0.5990	70.9863	780613.2000	4052
Shenzhen Victor Onward Texti	A	-0.0002	0.5211	-0.4645	0.0400	0.5897	28.6428	114573.6000	4173
	B	-0.0002	0.3608	-0.3504	0.0340	0.3784	12.5642	16004.6100	4173
Shenzhen Zhongheng Huafa	A	-0.0003	1.1422	-0.2018	0.0371	7.4705	220.7235	8281101.0000	4173
	B	-0.0001	0.4058	-0.3267	0.0356	0.5556	20.1182	51165.9000	4173
SVA Electron	A	0.0000	0.3359	-0.2668	0.0339	0.6183	11.3242	12313.9400	4173
	B	0.0001	0.2411	-0.2111	0.0324	0.0979	7.3592	3310.7160	4173
Weifu High Technology	A	0.0002	0.0974	-0.1063	0.0273	-0.0184	5.9232	954.0079	2679
	B	0.0002	0.1480	-0.1625	0.0309	-0.0258	6.1603	1445.2440	3472
Wuxi Littleswan	A	-0.0004	0.0984	-0.4374	0.0284	-1.1324	23.4049	53880.5000	3068
	B	0.0001	0.1339	-0.1234	0.0297	0.0591	5.9467	1177.3500	3249
Yantai Changyu	A	0.0010	0.1015	-0.1066	0.0278	0.1372	6.0329	1136.4590	2941
	B	0.0006	0.0955	-0.1054	0.0222	0.2024	7.2931	1653.3440	2134
Zhong Lu	A	0.0000	0.2777	-0.3285	0.0335	0.2692	11.4564	11646.7300	3893
	B	0.0000	0.3438	-0.2837	0.0328	0.1805	12.5528	15029.2200	3947

A represents shares listed in China A-share market, B represents shares listed in China B-share market

Appendix 3.2: Descriptive Statistics on Returns of Dual-Listing Chinese Firms Traded on China A, Hong Kong and New York Markets for the Period 01/01/1993 to 31/12/2008

Company	Market	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Observations
Aluminum	A	-0.0025	0.0959	-0.1060	0.0419	-0.0588	3.4370	3.7299	437
	H	0.0007	0.2771	-0.2202	0.0356	0.3630	7.9294	1903.3090	1840
	N	0.0007	0.2205	-0.1646	0.0363	0.3650	6.5742	1020.7950	1841
China Eastern Airlines	A	-0.0002	0.0974	-0.1059	0.0266	0.1460	6.8304	1789.3220	2910
	H	-0.0001	0.5600	-0.3131	0.0396	1.2754	21.7350	46252.3300	3105
	N	-0.0001	0.5049	-0.2129	0.0383	1.5094	22.3613	49692.4400	3106
China Life Insurance	A	-0.0014	0.0955	-0.1053	0.0358	0.0529	3.6575	9.5337	516
	H	0.0013	0.1490	-0.1741	0.0273	0.0447	8.2207	1492.6610	1314
	N	0.0013	0.1665	-0.1297	0.0305	0.3414	6.9625	885.8744	1315
China Mobile	H	0.0007	0.1561	-0.1652	0.0272	0.3033	7.0542	2043.8180	2919
	N	0.0007	0.1860	-0.1577	0.0298	0.2832	6.7121	1715.5110	2920
China Petrol and Chemical	A	0.0003	0.0967	-0.2365	0.0250	-0.2016	10.3050	4304.2950	1930
	H	0.0007	0.1625	-0.1797	0.0273	0.1385	7.3792	1716.0330	2139
	N	0.0006	0.1871	-0.1689	0.0293	0.2107	8.4141	2629.4860	2140
China Southern Airlines	A	0.0001	0.0963	-0.1055	0.0320	-0.1123	5.0205	244.1846	1418
	H	-0.0003	0.3576	-0.2054	0.0391	0.6119	9.1832	4931.4780	2979
	N	-0.0003	0.2636	-0.3279	0.0394	0.3443	8.2873	3528.8620	2979
China Telecom	H	0.0005	0.1867	-0.1527	0.0269	0.1961	9.3518	2696.5920	1598
	N	0.0005	0.2098	-0.1631	0.0300	0.4279	9.9579	3274.2310	1599
China United Telecom	A	0.0004	0.0964	-0.1231	0.0247	0.1219	7.1924	1194.1060	1625
	H	-0.0002	0.1477	-0.1596	0.0289	0.0083	6.2400	972.8005	2224
	N	-0.0002	0.2033	-0.1616	0.0320	0.2320	7.7535	2114.7470	2225
CNOOC	H	0.0011	0.2017	-0.1537	0.0267	0.1177	7.8027	2081.8990	2161
	N	0.0011	0.2221	-0.1705	0.0277	0.0951	8.7081	2938.3670	2162
Guangshen Railway	A	-0.0009	0.0955	-0.1058	0.0300	-0.2871	4.6709	68.6806	528
	H	0.0001	0.1902	-0.1616	0.0298	0.2118	7.7864	3170.9190	3296
	N	0.0002	0.2688	-0.2063	0.0294	0.3189	9.3289	5558.4090	3297
Huaneng Power	A	0.0001	0.0959	-0.2102	0.0252	-0.3798	8.2438	2151.1970	1839
	H	0.0005	0.2365	-0.1681	0.0313	0.3387	7.4573	2417.9880	2855
	N	0.0004	0.1684	-0.1749	0.0301	0.1526	6.8231	2276.2510	3714
Petro China	A	-0.0048	0.0948	-0.0946	0.0278	0.2846	4.7176	41.1983	302
	H	0.0010	0.1817	-0.1625	0.0246	0.1874	10.3662	5163.5710	2278
	N	0.0009	0.1443	-0.1488	0.0256	-0.0340	8.5416	2916.5920	2279
Sinopec Shanghai	A	0.0002	0.3246	-0.1959	0.0281	1.6569	20.9021	54581.2800	3952
	H	0.0002	0.2710	-0.1945	0.0344	0.4005	8.2587	4747.7860	4027
	N	0.0002	0.2427	-0.2667	0.0361	0.2787	8.3456	4846.8940	4027
Yanzhou Coal	A	0.0002	0.0959	-0.1432	0.0267	-0.1165	6.1826	1162.6110	2740
	H	0.0006	0.2632	-0.1897	0.0373	0.2301	6.9112	1812.6150	2805
	N	0.0006	0.2383	-0.2022	0.0369	0.3193	7.9486	2909.8260	2805

A represents shares listed in China A-share market, H represents shares listed in Hong Kong market, N represents shares traded in New York market

Appendix 3.3: Descriptive Statistics on Returns of Dual-Listing Chinese Firms Traded on China A and Hong Kong Markets for the Period 01/01/1993 to 31/12/2008

Company	Market	Mean	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Observations
Air China	A	0.0006	0.1350	-0.1059	0.0417	-0.1933	3.5812	12.5476	618
	H	-0.0003	0.2058	-0.2134	0.0349	0.2504	9.8530	2075.4820	1055
Angang Steel	A	0.0003	0.0966	-0.1124	0.0255	0.1961	6.0872	1159.3530	2873
	H	0.0008	0.3083	-0.3390	0.0436	0.4986	8.2726	3580.0850	2984
Anhui Conch Cement	A	0.0008	0.0957	-0.1638	0.0284	-0.0259	6.0145	681.3412	1799
	H	0.0011	0.2844	-0.2515	0.0398	0.2435	7.9389	2997.6520	2921
Anhui Expressway	A	0.0000	0.0961	-0.2611	0.0241	-1.0268	14.3623	8671.2820	1561
	H	0.0003	0.1871	-0.2877	0.0304	0.0119	9.5140	5595.8480	3165
Bank of China	A	-0.0003	0.0968	-0.1048	0.0243	0.2855	6.4011	322.1244	650
	H	-0.0006	0.2006	-0.1616	0.0267	0.6506	13.3429	3051.7780	674
Bank of Communications	A	-0.0024	0.0963	-0.1032	0.0313	-0.1332	4.2519	29.0796	426
	H	0.0008	0.1775	-0.1471	0.0289	0.4411	9.4964	1645.8510	919
Beijing North Star	A	-0.0004	0.0960	-0.1060	0.0444	-0.3050	3.2605	10.5761	577
	H	-0.0003	0.2609	-0.2712	0.0376	0.3613	8.4104	3767.8130	3035
Beiren Printing and Machinery	A	-0.0001	0.3509	-0.3022	0.0343	0.3250	12.3563	14011.8700	3823
	H	-0.0002	0.2799	-0.3031	0.0365	0.0928	10.7195	9982.2530	4018
China Citic Bank	A	-0.0024	0.0962	-0.1054	0.0315	-0.1511	4.5016	42.8156	438
	H	-0.0021	0.2256	-0.0987	0.0348	1.1114	9.8534	947.3519	438
China Coal Energy	A	-0.0052	0.0953	-0.1055	0.0385	-0.0971	3.4553	2.4297	238
	H	0.0006	0.2001	-0.2183	0.0478	-0.4656	5.9066	206.1095	531
China Construction Bank	A	-0.0023	0.0954	-0.1065	0.0281	0.1235	4.9848	55.1727	331
	H	0.0008	0.2093	-0.1319	0.0292	0.7335	10.4391	1985.8730	829
China Cosco Holding	A	-0.0019	0.0956	-0.1055	0.0434	0.1058	3.2388	1.6793	396
	H	0.0006	0.3463	-0.2606	0.0445	0.2345	10.8766	2371.1120	914
China Merchants Bank	A	0.0005	0.0956	-0.1054	0.0243	0.1709	6.4440	876.3830	1756
	H	0.0005	0.1894	-0.1450	0.0349	0.2835	6.9243	388.4545	593
China Oilfield Services	A	-0.0037	0.0955	-0.1057	0.0388	-0.0366	3.6205	5.3345	328
	H	0.0008	0.2348	-0.2313	0.0364	0.1945	8.7277	2190.3000	1595
China Railway Construction	A	-0.0007	0.0959	-0.1051	0.0347	-0.1970	3.8256	7.3926	212
	H	-0.0002	0.1842	-0.2088	0.0426	-0.5277	8.9053	313.3834	209
China Railway Group	A	-0.0014	0.0964	-0.1063	0.0338	0.1395	4.4853	26.8368	282
	H	-0.0011	0.2059	-0.2304	0.0441	0.0631	8.9244	406.7382	278
China Shenhua Energy	A	-0.0043	0.0954	-0.1057	0.0357	0.1260	4.0232	14.8510	321
	H	0.0009	0.2623	-0.2685	0.0349	0.1482	14.2057	4843.0110	925
China Ship Container	A	-0.0053	0.0961	-0.1068	0.0365	0.0418	3.9739	10.9475	275
	H	-0.0002	0.2231	-0.1812	0.0363	0.3983	8.3468	1442.8760	1185
China Shipping Development	A	0.0004	0.0962	-0.1516	0.0292	-0.3026	5.3776	432.4020	1724
	H	0.0005	0.3323	-0.4144	0.0441	0.0450	12.1921	12985.3900	3688
Datang International Power	A	0.0004	0.2505	-0.2195	0.0360	0.1199	8.4564	3819.4540	3073
	H	0.0003	0.0957	-0.1055	0.0414	-0.0555	3.5519	6.9979	530
Dongfang Electric	A	0.0002	0.1500	-0.1267	0.0297	-0.0285	5.4663	873.5503	3445
	H	0.0006	0.3562	-0.4643	0.0418	-0.1415	12.6908	14889.8900	3802
Guangzhou Pharmaceutical	A	-0.0004	0.0955	-0.1193	0.0267	-0.2435	5.7905	689.0507	2061
	H	0.0003	0.2584	-0.1743	0.0332	0.3827	7.9855	3088.9310	2914
Guangzhou Shipyard	A	0.0003	0.2951	-0.2427	0.0340	0.7478	10.9372	10761.1500	3959
	H	0.0004	0.2797	-0.2400	0.0421	0.4678	8.3827	4997.2370	4018
Hisense Kelon	A	-0.0003	0.3484	-0.2968	0.0339	0.2157	13.7622	15690.5400	3246
	H	-0.0009	0.5517	-0.1082	0.0256	4.0302	91.8432	819350.8000	2471
Huadian Power	A	-0.0001	0.0967	-0.4139	0.0342	-1.8613	24.9319	21011.2800	1019
	H	0.0002	0.1802	-0.2762	0.0308	0.1131	9.4131	4255.1210	2480
Industrial and Commerce Bank	A	0.0003	0.1521	-0.1178	0.0301	0.5958	7.5077	514.4875	568
	H	0.0002	0.0958	-0.1054	0.0271	0.1342	5.4382	142.3956	568
Jiangsu Expressway	A	-0.0001	0.0962	-0.1488	0.0213	-0.3001	8.0484	2235.6860	2076
	H	0.0004	0.2059	-0.2135	0.0304	-0.0364	9.0649	4603.1900	3003
Jiangxi Cooper	A	0.0004	0.2534	-0.2718	0.0437	0.3366	7.2618	2337.9330	3014
	H	0.0005	0.2554	-0.1055	0.0322	0.2444	7.0970	1289.5750	1818
Jingwei Textile	A	-0.0006	0.0970	-0.4017	0.0295	-1.1723	16.2450	23716.3500	3146
	H	-0.0001	0.3221	-0.2411	0.0399	0.5770	10.4807	8040.0430	3368
Maanshan Iron	A	0.0000	0.3436	-0.3513	0.0299	0.8779	21.0002	53274.9000	3909
	H	0.0000	0.3132	-0.3594	0.0387	0.5508	10.5620	9623.2910	3955
Nanjing Panda	A	-0.0004	0.0966	-0.3340	0.0314	-0.5453	8.7129	4456.6290	3162
	H	-0.0002	0.3677	-0.3604	0.0468	0.1665	10.6348	8039.9590	3304
Northest Electric	A	-0.0003	0.5158	-0.5402	0.0488	0.3023	17.6052	31330.2400	3519
	H	-0.0003	0.7360	-0.2790	0.0322	3.2306	85.4404	970164.4000	3405
Ping An Insurance	A	-0.0011	0.0954	-0.1054	0.0364	-0.2009	3.7342	13.9813	479
	H	0.0011	0.1734	-0.1577	0.0298	0.0713	8.4617	1466.3880	1179
Shangdong Xinhua	A	-0.0001	0.2810	-0.2007	0.0352	0.3367	8.9032	4605.2610	3131
	H	-0.0003	0.0965	-0.1065	0.0276	-0.1602	6.1744	1260.9820	2973
Shenji Group	A	0.0002	0.5601	-0.2474	0.0370	1.4482	21.3585	56304.1700	3912
	H	0.0000	0.3932	-0.2532	0.0439	0.8620	11.8897	13430.6400	3931
Sinopec Yizheng	A	-0.0002	0.3310	-0.2991	0.0401	0.8169	11.0175	10742.6900	3851
	H	0.0000	0.3683	-0.2059	0.0296	0.9097	14.3054	19564.4400	3581
Tianjin Capital Environment	A	0.0001	0.3522	-0.3243	0.0415	0.6389	10.7652	9846.9040	3816
	H	0.0001	0.2499	-0.2375	0.0301	0.0565	8.2531	4052.6200	3523
Tsigtao Brewery	A	0.0002	0.3230	-0.2440	0.0285	1.1420	17.5219	36044.1300	4003
	A	0.0005	0.3516	-0.4419	0.0352	0.2271	16.8307	32187.2600	4034
Weichai Power	A	-0.0018	0.0956	-0.1056	0.0332	-0.0898	4.2727	30.0793	437
	H	0.0005	0.1846	-0.1890	0.0349	0.2053	7.1173	894.5804	1254
Zijin Mining	A	-0.0059	0.0964	-0.1055	0.0421	0.0500	3.3164	0.8167	178
	H	0.0017	0.2614	-0.1781	0.0393	0.0576	6.5313	681.8846	1311
ZTE	A	0.0007	0.1460	-0.1055	0.0253	0.2833	5.9993	1126.2000	2901
	H	0.0002	0.2307	-0.2809	0.0331	-0.7100	13.7379	5176.6610	1059

A represents shares listed in China A-share market, H represents shares listed in Hong Kong market

Appendix 4: Mean and Variance of Return Distribution

Appendix 4.1: Paired T-Test, Variance Results for Chinese Dual-Listed Firms on China A and Hong Kong Markets

Company Name	Paired Correlation	Paired Differences Mean	Paired Differences Std. Deviation	Paired T Statistic	P Value (2-tailed)	F-Distribution F Value	F-Distribution P Value (2-tailed)	No. of Observations
Air China	0.4511	0.0009	0.0441	0.4841	0.6285	0.9719	0.7231	618
Angang Steel Plate	0.2684	-0.0007	0.0422	-0.9385	0.3481	0.3818	0.0000	2873
Anhui Conch Cement	0.4365	-0.0008	0.0353	-0.9821	0.3262	0.5980	0.0000	1799
Anhui Expressway	0.1119	-0.0004	0.0322	-0.5088	0.6109	0.5980	0.0000	1561
Bank of China	0.3891	0.0004	0.0284	0.3625	0.7171	0.8064	0.0062	650
Bank of Communications	0.5506	-0.0015	0.0330	-0.9378	0.3489	0.7015	0.0003	426
Beijing North Star	0.5182	0.0006	0.0424	0.3232	0.7467	1.1272	0.1510	577
Beiren Printing and Machinery	0.1630	0.0001	0.0458	0.1647	0.8692	0.8883	0.0003	3823
China Citic Bank	0.3792	-0.0004	0.0370	-0.2044	0.8381	0.8193	0.0375	438
China Coal Energy	0.4744	-0.0006	0.0509	-0.1772	0.8595	0.4708	0.0000	238
China Construction Bank	0.6091	-0.0009	0.0319	-0.5106	0.6100	0.4935	0.0000	331
China Cosco Holding	0.4664	-0.0001	0.0566	-0.0473	0.9623	0.4915	0.0000	396
China Merchants Bank	0.5785	-0.0001	0.0317	-0.0596	0.9525	0.9537	0.5646	593
China Oilfield Services	0.4498	-0.0005	0.0515	-0.1751	0.8611	0.4881	0.0000	328
China Railway Construction	0.5359	-0.0007	0.0379	-0.2529	0.8006	0.6635	0.0032	209
China Railway Group	0.5227	-0.0005	0.0390	-0.1960	0.8447	0.5830	0.0000	278
China Shenhua Energy	0.4872	-0.0012	0.0446	-0.4803	0.6313	0.5233	0.0000	321
China Shipping Development	0.3275	-0.0006	0.0394	-0.5982	0.5498	0.5990	0.0000	1724
China Shipping Container	0.4596	0.0003	0.0498	0.1086	0.9136	0.4481	0.0000	275
Datang International Power	0.3305	0.0001	0.0495	0.0549	0.9563	0.8863	0.1654	530
Dongfang Electric	0.1906	-0.0005	0.0473	-0.5863	0.5577	0.4783	0.0000	3445
Guangzhou Pharmaceutical	0.2997	-0.0010	0.0334	-1.3679	0.1715	0.8152	0.0000	2061
Guangzhou Shipyard	0.1788	0.0000	0.0491	0.0493	0.9607	0.6531	0.0000	3959
Huadian Power	0.2278	0.0001	0.0424	0.0456	0.9636	1.0016	0.9791	1019
Industrial and Commercial Bank	0.4931	-0.0001	0.0289	-0.1083	0.9138	0.8064	0.0105	568
Jingwei Textile	0.1436	-0.0006	0.0465	-0.6866	0.4924	0.5298	0.0000	3146
Jiangsu Expressway	0.1899	-0.0009	0.0304	-1.4050	0.1602	0.6610	0.0000	2076
Jiangxi Cooper	0.3739	-0.0006	0.0389	-0.6251	0.5320	0.7587	0.0000	1818
Maanshan Iron	0.1593	0.0000	0.0450	0.0397	0.9683	0.5934	0.0000	3909
Nanjing Panda	0.1811	-0.0003	0.0520	-0.3599	0.7189	0.4360	0.0000	3162
Northest Electric	0.1878	-0.0001	0.0537	-0.0687	0.9453	0.4244	0.0000	3405
Ping An Insurance	0.6359	-0.0014	0.0329	-0.9101	0.3632	0.8138	0.0245	479
Shandong Chengming	0.4669	0.0015	0.0441	0.3909	0.6964	0.8617	0.3814	140
Shangdong Xinhua	0.1855	-0.0001	0.0405	-0.1282	0.8980	0.6110	0.0000	2973
Shenji Group	0.1709	0.0002	0.0524	0.2736	0.7844	0.7099	0.0000	3912
Sinopec Yizheng	0.1725	0.0003	0.0461	0.4011	0.6884	0.5264	0.0000	3581
Tianjin Capital Environment	0.1599	-0.0001	0.0478	-0.0989	0.9212	0.5094	0.0000	3523
Tsigtao Brewery	0.1130	-0.0002	0.0427	-0.2343	0.8148	0.6578	0.0000	4003
Weichai Power	0.3838	-0.0004	0.0432	-0.1762	0.8602	0.5890	0.0000	437
Zijin Mining	0.4095	-0.0033	0.0582	-0.7566	0.4503	0.4758	0.0000	178
ZTE	0.4043	0.0002	0.0337	0.1514	0.8797	0.7178	0.0000	1059

Appendix 4.2: Paired T-Test, Variance Results for Chinese Dual-Listed Firms on China A and China B Markets

	Paired	Paired Differences			P Value	F-Distribution	
Company Name	Correlation	Mean	Std. Deviation	T Value	(2-tailed)	F Value	P Value (2-tailed)
Anhui Guijing Distiller	0.7250	-0.0001	0.0211	-0.2300	0.8180	0.7268	0.000
Bengang Steel Plate	0.6870	-0.0001	0.0206	-0.1640	0.8700	1.3877	0.000
BOE Technology	0.7600	0.0002	0.0220	0.3840	0.7010	1.1993	0.000
Changchai Company	0.7410	0.0000	0.0218	0.0920	0.9270	1.2401	0.000
China Fanda	0.7640	0.0000	0.0226	-0.0740	0.9410	1.4371	0.000
China First Pencil	0.6710	0.0000	0.0228	0.0460	0.9630	1.3311	0.000
China Interational Marine Container	0.6400	-0.0002	0.0220	-0.3280	0.7430	1.0719	0.138
China Merchants Property	0.6780	0.0000	0.0226	0.0860	0.9320	1.3783	0.000
China Textile Machinery	0.5930	0.0004	0.0252	0.6410	0.5220	1.0305	0.521
China Vanke	0.6740	-0.0002	0.0225	-0.3510	0.7250	0.9464	0.239
Congqing Changan Automobile	0.6900	0.0001	0.0232	0.2030	0.8390	1.1091	0.027
CSG Holding	0.7010	-0.0001	0.0231	-0.1560	0.8760	1.4780	0.000
Dalian Referigerator	0.6920	0.0000	0.0196	-0.0040	0.9970	0.7399	0.000
Danhua chemical	0.7430	0.0002	0.0246	0.3850	0.7000	1.2125	0.000
Dazhong Transportation	0.7200	0.0001	0.0208	0.2080	0.8350	1.3053	0.000
Double Coin	0.6300	0.0000	0.0263	-0.0550	0.9560	1.2539	0.000
Eatern Communications	0.7080	0.0001	0.0238	0.1410	0.8880	1.2686	0.000
Foshan Electrical	0.6920	-0.0001	0.0182	-0.2130	0.8320	1.5089	0.000
Guangdong Electric Power	0.6100	0.0001	0.0206	0.2440	0.8070	1.3643	0.000
Guangdong Provincial Expressway	0.6610	-0.0001	0.0180	-0.2130	0.8320	1.2463	0.000
Guangdong Sunrise	0.5530	0.0000	0.0254	-0.0430	0.9660	0.7270	0.000
Hainan Airlines	0.7240	0.0001	0.0221	0.2390	0.8110	1.1119	0.024
Hainan Dadonghai Tourism	0.5890	-0.0001	0.0264	-0.2020	0.8400	1.3166	0.000
Hainan Pearl River Holdings	0.8130	-0.0003	0.0198	-0.5870	0.5570	0.8392	0.000
Hefei Meiling	0.6920	0.0000	0.0221	-0.0750	0.9400	1.0779	0.109
Huadian Energy	0.6320	0.0001	0.0216	0.1660	0.8680	1.0813	0.095
Huangshan Tourism	0.6310	0.0001	0.0219	0.1510	0.8800	1.2166	0.000
Huaxin Cement	0.6490	-0.0001	0.0251	-0.1880	0.8510	0.9683	0.492
Inner Mongolia Eerduosica	0.6720	0.0002	0.0223	0.3010	0.7640	0.8053	0.000
Jiangling Motors	0.6670	0.0000	0.0233	0.0350	0.9720	1.3782	0.000
Jinan Qingqi Motorcycle	0.6520	0.0003	0.0223	0.5670	0.5710	1.3565	0.000
Jishan Development	0.6290	-0.0002	0.0285	-0.2570	0.7970	1.2831	0.000
Jinzhou Port	0.7250	0.0001	0.0202	0.2860	0.7750	1.1832	0.000
Konka Group	0.7300	-0.0002	0.0192	-0.4220	0.6730	0.8136	0.000
Livzon Pharmaceutical	0.7190	0.0001	0.0202	0.1350	0.8930	1.2176	0.000
Luthai Textile	0.6970	0.0000	0.0199	-0.0580	0.9540	1.3438	0.000
SGSB Group	0.6060	0.0001	0.0289	0.2050	0.8380	1.4208	0.000
Shandong Chengming	0.6770	-0.0001	0.0210	-0.1920	0.8470	1.2163	0.000
Shanghai chlor-alkali	0.6370	-0.0002	0.0255	-0.2710	0.7870	1.2163	0.000
Shanghai Baosight	0.6430	0.0000	0.0240	0.0250	0.9800	1.1300	0.009
Shanghai Diesel	0.6400	0.0001	0.0253	0.1940	0.8460	1.3139	0.000
Shanghai Dingli Technology	0.6320	0.0000	0.0263	0.0710	0.9430	1.4855	0.000
Shanghai Erfangji	0.6260	0.0002	0.0267	0.3080	0.7580	1.2170	0.000
Shanghai Friendship	0.5810	-0.0001	0.0236	-0.1260	0.9000	1.2468	0.000
Shanghai Haixin Group	0.7200	-0.0001	0.0224	-0.2410	0.8090	1.0307	0.518
Shanghai Highly Group	0.6590	0.0000	0.0242	-0.0610	0.9510	1.4389	0.000
Shanghai Jinjiang International	0.6430	-0.0001	0.0220	-0.2370	0.8130	1.4031	0.000
Shanghai Lujiazui	0.6890	0.0000	0.0217	-0.0800	0.9360	1.3391	0.000
Shanghai Potevio	0.6770	0.0000	0.0247	-0.0070	0.9950	1.4738	0.000
Shanghai Sanmao	0.7150	0.0003	0.0248	0.4360	0.6630	1.2848	0.000
Shanghai Wingsung	0.6300	-0.0001	0.0273	-0.0950	0.9240	1.1680	0.001
Shanghai Yaohua Pilkington	0.6220	0.0000	0.0245	-0.0440	0.9650	1.4315	0.000
Shanghai Zhenhua Port Machinery	0.6230	0.0000	0.0240	-0.0300	0.9760	0.9751	0.591
Shanghai Automation Instrument	0.7580	0.0000	0.0219	0.0380	0.9700	1.2660	0.000
Shanghai Dajiang	0.6740	0.0002	0.0237	0.2840	0.7770	1.2513	0.000
Shanghai Jinjiang Inernational Hotels	0.6550	0.0001	0.0213	0.1410	0.8880	1.4332	0.000
Shanghai Jinqiao	0.7200	0.0001	0.0214	0.1960	0.8450	1.5097	0.000
Shanghai Kaikai	0.5780	0.0001	0.0363	0.0980	0.9220	2.0251	0.000
Shanghai Mechanic and Electrical	0.6420	0.0001	0.0235	0.1430	0.8860	1.2103	0.000
Shanghai MRA Trading	0.6380	0.0000	0.0247	0.0570	0.9540	0.7523	0.000
Shanghai Nine Dragon	0.6740	-0.0001	0.0247	-0.2330	0.8160	1.2191	0.000
Shenzhen Properties and Resources	0.7160	0.0002	0.0210	0.3720	0.7100	0.8776	0.005
Shenzhen SEG	0.7010	-0.0001	0.0230	-0.1570	0.8760	1.3457	0.000
Shenzhen Special Economic Zone	0.7700	0.0001	0.0222	0.1940	0.8460	1.3318	0.000

(cont.)

Company Name	Paired Correlation	Paired Differences Mean	Paired Differences Std. Deviation	T Value	P Value (2-tailed)	F-Distribution F Value	F-Distribution P Value (2-tailed)
Shenzhen Textile	0.7140	0.0001	0.0228	0.1280	0.8980	1.2987	0.000
Shenzhen Accord Pharmaceutical	0.7150	0.0001	0.0208	0.2780	0.7810	1.2018	0.000
Shenzhen International Enterprise	0.7610	0.0000	0.0236	-0.0730	0.9410	0.8271	0.000
Shenzhen Nanshan Power	0.6440	0.0001	0.0219	0.2820	0.7780	0.8226	0.000
shenzhen Shenbao Industrial	0.7300	0.0001	0.0232	0.1720	0.8630	1.4042	0.000
Shenzhen Tellus	0.7710	0.0002	0.0222	0.3460	0.7290	1.1885	0.000
Shenzhen Victor Onward Textile	0.6250	0.0003	0.0257	0.4710	0.6370	1.0841	0.085
Shenzhen Zhongheng Huafa	0.5240	-0.0001	0.0324	-0.0980	0.9220	2.1227	0.000
Shijianzhuang Baoshi	0.7320	0.0003	0.0224	0.5240	0.6000	1.2580	0.000
SVA Electron	0.7030	0.0000	0.0224	-0.0780	0.9380	1.2731	0.000
Weifu High Technology	0.6640	0.0001	0.0224	0.2550	0.7990	1.1573	0.002
Wuxi Littleswan	0.7160	0.0000	0.0227	0.0220	0.9820	1.4839	0.000
Yantai Changyu	0.4720	-0.0001	0.0238	-0.1830	0.8550	0.9292	0.117
Zhong Lu	0.6630	0.0001	0.0249	0.1910	0.8480	1.3060	0.000

Appendix 4.3: Paired T-Test, Variance Results for Chinese Triple-Listed Firms on China A, Hong Kong and New York Markets

		Paired	Paired Differences		Paired	P Value	F-Distribution		No. of
Company Name	Pairs	Correlation	Mean	Std. Deviation	T Statistic	(2-tailed)	F Value	P Value (2-tailed)	Observations
Aluminum Corporation	A-H	0.408	-0.000673	0.0505	-0.2786	0.7807	0.7005	0.0002	436
	A-N	0.218	-0.000796	0.0599	-0.2780	0.7811	0.6277	0.0000	436
	H-N	0.544	-0.000124	0.0492	-0.0525	0.9581	0.8961	0.2523	436
China Eastern Airline	A-H	0.259	-0.000054	0.0409	-0.0712	0.9432	0.4697	0.0000	2909
	A-N	0.204	-0.000058	0.0416	-0.0757	0.9397	0.4937	0.0000	2909
	H-N	0.677	-0.000004	0.0308	-0.0075	0.9940	1.0512	0.1784	2909
China Life Insurance	A-H	0.574	-0.001266	0.0325	-0.8840	0.3771	1.0649	0.4756	515
	A-N	0.284	-0.001345	0.0446	-0.6850	0.4936	0.8576	0.0816	515
	H-N	0.527	-0.000079	0.0358	-0.0501	0.9601	0.8053	0.0141	515
China Petrol and Chemical	A-H	0.355	-0.000501	0.0297	-0.7402	0.4593	0.8353	0.0001	1929
	A-N	0.247	-0.000519	0.0336	-0.6798	0.4967	0.7198	0.0000	1929
	H-N	0.637	-0.000018	0.0243	-0.0328	0.9738	0.8618	0.0011	1929
China Southern Airline	A-H	0.384	0.000262	0.0372	0.2652	0.7909	0.8394	0.0010	1417
	H-N	0.717	-0.000030	0.0270	-0.0417	0.9668	0.9044	0.0586	1417
	A-N	0.277	0.000232	0.0415	0.2108	0.8331	0.7591	0.0000	1417
China United Telecom	A-H	0.273	-0.000107	0.0324	-0.1335	0.8938	0.7385	0.0000	1624
	A-N	0.175	-0.000125	0.0364	-0.1389	0.8896	0.6190	0.0000	1624
	H-N	0.634	-0.000018	0.0259	-0.0282	0.9775	0.8383	0.0004	1624
Guangshen Railway	A-H	0.286	0.000009	0.0371	0.0055	0.9956	0.8713	0.1142	527
	A-N	0.173	-0.000062	0.0425	-0.0334	0.9734	0.7006	0.0000	527
	H-N	0.503	-0.000071	0.0340	-0.0477	0.9619	0.8040	0.0124	527
Huaneng Power	A-H	0.207	-0.000539	0.0320	-0.7219	0.4704	0.9729	0.5561	1838
	A-N	0.146	-0.000562	0.0346	-0.6964	0.4863	0.8335	0.0001	1838
	H-N	0.642	-0.000023	0.0226	-0.0441	0.9649	0.8567	0.0009	1838
PetroChina	A-H	0.423	-0.001655	0.0387	-0.7423	0.4585	0.4571	0.0000	301
	A-N	0.182	-0.001896	0.0465	-0.7088	0.4790	0.4265	0.0000	301
	H-N	0.516	0.000000	0.0221	-0.1010	0.9190	0.9329	0.5472	301
Sinopec Shanghai Petro	A-H	0.127	0.000109	0.0429	0.1603	0.8727	0.6010	0.0000	3951
	A-N	0.104	0.000107	0.0420	0.1605	0.8725	0.6679	0.0000	3951
	H-N	0.713	-0.000002	0.0268	-0.0049	0.9961	1.1112	0.0005	3951
Yanzhou Coal Mining	A-H	0.175	-0.000507	0.0418	-0.6343	0.5259	0.5121	0.0000	2739
	A-N	0.136	-0.000513	0.0425	-0.6320	0.5274	0.5213	0.0000	2739
	H-N	0.716	-0.000006	0.0279	-0.0115	0.9908	1.0179	0.3215	2739
China Telecom	H-N	0.665	-0.000022	0.0234	-0.0377	0.9700	0.8053	0.0000	1597
China Mobile	H-N	0.588	0.000001	0.0260	0.0016	0.9988	0.8291	0.0000	2918
CNOOC	H-N	0.625	-0.000037	0.0230	-0.0720	0.9420	0.9557	0.3054	2045

Appendix 5: Market Co-movement Test Results

Appendix 5.1: Regression output for Chinese shares dual-Listed on China A and China B (Shenzhen) markets

	Shenzhen A	Shenzhen B	RMB/HK$	R Square	Adjusted R Square	DW
Anhui Guijing Distiller	0.768***	-0.743***	-0.300	0.2943	0.2930	2.047
	(39.69)	(-52.54)	(-0.65)			
Bengang Steel Plate	0.961***	-0.918***	-0.249	0.4574	0.4563	2.072
	(44.02)	(-58.90)	(-0.56)			
BOE Technology	0.841***	-0.815***	0.201	0.2442	0.2420	1.963
	(28.94)	(-30.28)	(0.34)			
Changchai Company	0.946***	-0.910***	0.541	0.3768	0.3756	2.045
	(45.50)	(-57.70)	(1.03)			
China Fanda	0.989***	-0.932***	0.650	0.3839	0.3827	1.960
	(52.90)	(-58.19)	(1.15)			
China Interational Marine	0.923***	-0.840***	0.715	0.4240	0.4231	2.030
	(77.32)	(-60.47)	(1.34)			
China Merchants Property	1.051***	-0.902***	-0.090	0.4051	0.4042	2.093
	(95.29)	(-66.21)	(-0.17)			
China Vanke	0.809***	-0.756***	-0.452	0.2908	0.2896	2.089
	(42.02)	(-44.05)	(-0.73)			
Congqing Changan Automobile	1.051***	-1.067***	0.694	0.4128	0.4116	2.087
	(38.80)	(-54.56)	(1.16)			
CSG Holding	0.893***	-0.913***	0.189	0.4166	0.4157	2.033
	(92.80)	(-82.09)	(0.32)			
Dalian Referigerator	0.954***	-0.900***	-0.414	0.4038	0.4025	2.113
	(46.55)	(-57.22)	(-1.02)			
Foshan Electrical	0.813***	-0.704***	0.203	0.3920	0.3909	2.130
	(57.57)	(-61.81)	(0.66)			
Guangdong Electric Power	0.865***	-0.866***	-0.681	0.3892	0.3882	2.059
	(50.55)	(-63.48)	(-1.55)			
Guangdong Pear River	0.865***	-0.825***	0.258	0.3428	0.3414	2.155
	(36.65)	(-44.76)	(0.49)			
Guandgong Sunrise	0.637***	-0.704***	-1.161	0.1981	0.1968	2.076
	(35.58)	(-33.25)	(-1.32)			
Hainan Dadonghai Tourism	0.463***	-0.475***	0.262	0.1154	0.1137	2.122
	(19.67)	(-33.83)	(0.51)			
Hainan Pearl River Holdings	0.927***	-0.876***	0.268	0.1862	0.1849	2.367
	(30.06)	(-38.04)	(0.28)			
Hefei Meiling	0.968***	-0.900***	0.700	0.3110	0.3097	2.021
	(42.06)	(-50.16)	(-1.24)			
Jiangling Motors	0.864***	-0.806***	1.024*	0.2712	0.2700	2.090
	(40.94)	(-48.58)	(1.90)			
Konka Group	0.897***	-0.705***	-1.152**	0.3864	0.3854	2.090
	(63.47)	(-54.63)	(-2.54)			
Livzon Pharmaceutical	0.841***	-0.857***	0.555	0.3457	0.3447	2.197
	(64.09)	(-55.75)	(1.06)			
Luthai Textile	0.842***	-0.808***	0.032	0.3530	0.3512	1.956
	(32.09)	(-36.74)	(0.06)			
Shangdong Chenming Paper	0.941***	-0.912***	-0.165	0.3861	0.3843	2.063
	(35.42)	(-43.73)	(-0.46)			
Shenzhen SEG	0.844***	-0.827***	-0.341	0.2816	0.2802	1.989
	(36.76)	(-49.06)	(-0.58)			
Shenzhen Special Economic Zon	0.996***	-0.943***	-0.803	0.4025	0.4015	2.167
	(59.37)	(-68.75)	(-1.28)			
Shenzhen Textile	0.995***	-0.954***	-0.822	0.3220	0.3209	2.065
	(45.32)	(-45.33)	(-0.87)			
Shenzhen Accord	0.892***	-0.939***	-0.376	0.3233	0.3222	2.107
	(41.00)	(-45.00)	(-0.62)			
Shenzhen International Enterpris	1.010***	-0.911***	0.808	0.2649	0.2635	2.034
	(40.56)	(46.51)	(1.42)			
Shenzhen Nanshan Power	0.920***	-0.864***	0.789	0.3571	0.3560	2.273
	(52.05)	(-59.41)	(1.22)			
Shenzhen Properties	0.783***	-0.837***	-0.678	0.3045	0.3033	2.111
	(55.37)	(-58.04)	(-1.43)			
Shenzhen Shenbao Industrial	0.808***	-0.718***	-0.852	0.1921	0.1908	2.228
	(55.92)	(-38.28)	(-1.16)			
Shenzhen Tellus	0.718***	-0.438***	-0.008	0.1812	0.1800	2.323
	(55.92)	(-33.46)	(-0.009)			
Shenzhen Victor Onward Textile	0.940***	-0.939***	-1.165*	0.2663	0.2651	2.239
	(48.01)	(-52.38)	(-1.82)			
Shenzhen Zhongheng Huafa	0.879***	-0.834***	-0.016	0.2180	0.2167	2.106
	(56.80)	(-50.89)	(-0.02)			
Shijianzhuang Baoshi	0.872***	-0.887***	-1.215*	0.2492	0.2478	2.058
	(33.29)	(-48.01)	(-1.89)			
Weifu High Technology	0.990***	-0.913***	-0.920**	0.3028	0.3012	2.148
	(39.10)	(-40.71)	(-1.98)			
Wuxi Littleswan	1.001***	-0.898	-0.016	0.2987	0.2973	2.014
	(56.69)	(-56.52)	(-0.03)			
Yantai Changyu	0.835***	-0.884	0.315	0.3018	0.3000	1.974
	(28.50)	(-40.40)	(0.60)			

*t statistics is shown in parenthesis, * denotes rejection at 10% significant level,*
*** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

Appendix 5.2: Regression output for Chinese shares dual-Listed on China A and China B (Shanghai) Markets

	Shanghai A	Shanghai B	RMB/US$	R Square	Adjusted R Square	DW
China First Pencil	1.073***	-0.952***	0.170***	0.3726	0.3717	2.152
	(70.41)	(-58.39)	(2.86)			
China Textile Machinery	0.825***	-0.773***	0.011	0.3121	0.3111	2.149
	(53.40)	(-46.69)	(0.04)			
Danhua chemical	0.802***	-0.800***	-0.096	0.3308	0.3298	2.133
	(47.02)	(-47.47)	(-0.29)			
Dazhong Transportation	0.951***	-0.885***	-0.222	0.4277	0.4269	2.000
	(72.42)	(-59.22)	(-1.02)			
Double Coin	0.973***	-0.977***	0.063	0.4175	0.4167	2.057
	(72.35)	(-62.42)	(0.21)			
Eastern Communications	0.855***	-0.743***	0.238	0.2527	0.2513	1.903
	(34.20)	(-42.01)	(0.81)			
Hainan Airlines	0.887***	-0.767***	-0.058	0.2773	0.2755	2.109
	(30.51)	(-45.60)	(-0.15)			
Huadian Energy	0.930***	-0.924***	0.017	0.4017	0.4006	1.970
	(39.17)	(-59.96)	(0.04)			
Huangshan Tourism	0.904***	-0.823***	-0.598*	0.3017	0.3003	2.049
	(32.36)	(-49.61)	(-1.67)			
Huaxin Cement	1.082***	-0.939***	-0.182	0.2891	0.2879	2.097
	(10.12)	(-16.78)	(-0.45)			
Inner Mongolia Eerduosica	0.908***	-0.812***	0.114	0.2154	0.2130	1.979
	(28.38)	(-38.09)	(0.99)			
Jinan Qingqi Motorcycle	0.594***	-0.334***	-0.116	0.2630	0.2615	2.106
	(25.22)	(-41.09)	(-0.25)			
Jinshan Development	0.923***	-1.100***	-0.012	0.3484	0.3474	2.125
	(57.81)	(-64.11)	(-0.03)			
Jinzhou Port	0.649***	-0.641***	-0.052	0.2200	0.2181	1.839
	(28.35)	(-32.72)	(-0.14)			
SGSB Group	0.797***	-0.697***	-0.326	0.1852	0.1840	2.058
	(39.88)	(-34.41)	(-1.00)			
Shanghai Automation	0.694***	-0.610***	0.603	0.2292	0.2280	2.149
	(40.60)	(-34.79)	(1.52)			
Shanghai Baosight	0.124***	-0.281***	-4.198***	0.0469	0.0455	2.005
	(7.22)	(-20.22)	(-20.85)			
Shanghai Chlor-Alkali	0.806***	-0.740***	0.602***	0.1820	0.1808	2.036
	(55.71)	(-42.78)	(5.17)			
Shanghai Diesel	1.049***	-1.026	0.852***	0.4005	0.3995	1.975
	(76.38)	(-67.16)	(3.20)			
Shanghai Dingli Technology	0.873***	-0.734***	-0.160	0.2540	0.2530	2.047
	(63.66)	(-37.78)	(-0.43)			
Shanghai Erfangji	0.696***	-0.646***	0.167	0.1771	0.1759	2.116
	(32.34)	(-36.93)	(0.70)			
Shanghai Friendship	0.719***	-0.631***	-0.567	0.2287	0.2274	2.141
	(38.12)	(-33.43)	(-1.54)			
Shanghai Haixin Group	0.648***	-0.881***	0.027	0.3108	0.3098	2.106
	(53.36)	(-68.51)	(0.09)			
Shanghai Highly Group	0.926***	-0.914***	-0.131	0.3878	0.3870	2.074
	(47.37)	(-52.87)	(-0.36)			
Shanghai Jinjiang Hotel	1.038***	-0.882***	-0.162	0.3499	0.3487	2.168
	(42.55)	(-53.03)	(-0.40)			
Shanghai Jinjiang Internatior	0.951***	-0.840***	-0.137	0.3754	0.3744	2.127
	(67.16)	(-73.82)	(-0.70)			
Shanghai Jinqiao	0.976***	-0.883***	-0.046	0.4350	0.4342	2.133
	(25.29)	(-66.54)	(-0.26)			
Shanghai Kaikai	0.970***	-0.816***	0.331	0.0972	0.0946	2.079
	(41.46)	(-39.55)	(1.02)			
Shanghai Lujiazui	1.016***	-0.917***	-0.416*	0.4461	0.4452	2.061
	(64.29)	(-67.29)	(-1.66)			
Shanghai Mechanic	0.799***	-0.741***	1.639***	0.2101	0.2089	2.123
	(40.08)	(-42.52)	(5.01)			
Shanghai MRA Trading	0.931***	-0.833***	0.468	0.3174	0.3163	2.179
	(48.04)	(-47.52)	(1.20)			
Shanghai Nine Dragon	0.734***	-0.441***	-0.222	0.1126	0.1100	1.950
	(21.80)	(-17.14)	(-0.64)			
Shanghai Potevio	0.964***	-0.855***	-0.389	0.3193	0.3182	2.097
	(61.14)	(-46.85)	(-1.20)			
Shanghai Sanmao	0.979***	-0.800***	0.040	0.3049	0.3039	2.131
	(46.79)	(-38.62)	(0.29)			
Shanghai Wingsung	0.745***	-0.710***	-0.050	0.2041	0.2030	2.158
	(47.42)	(-44.95)	(-0.23)			
Shanghai Yaohua Pilkington	0.987***	-0.910***	0.917***	0.3634	0.3624	2.126
	(56.49)	(-53.37)	(2.91)			
Shanghai Zhenhua Port	0.734***	-0.655***	-0.007	0.1534	0.1510	1.956
	(21.96)	(-24.30)	(-0.01)			
SVA Electron	0.980***	-0.850***	-0.104	0.3914	0.3910	2.270
	(56.79)	(-54.24)	(-0.40)			
Zhong Lu	0.762***	-0.753***	0.200	0.2362	0.2350	2.029
	(38.28)	(-69.65)	(0.41)			

*t statistics is shown in parenthesis, * denotes rejection at 10% significant level,*
*** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

Appendix 5.3: Regression output for Chinese shares dual-Listed on China A and Hong Kong markets

	Shanghai A	Hang Seng	RMB/HK$	R Squre	Adjusted R Square	DW
Air China	0.972***	-1.203***	-0.420	0.3782	0.3721	2.069
	(14.66)	(-19.70)	(-0.30)			
Angang Steel Plate	0.774***	-1.098***	-0.943	0.2171	0.2154	1.960
	(22.04)	(-32.97)	(-1.02)			
Anhui Conch Cement	0.678***	-0.918***	0.491	0.2006	0.1980	2.093
	(18.47)	(-21.992)	(0.56)			
Anhui Expressway	0.904***	-0.751***	0.544	0.2370	0.2340	2.119
	(21.90)	(-19.29)	(0.669)			
Bank of China	0.798***	-0.899***	-0.531	0.6118	0.6082	2.238
	(31.05)	(-28.91)	(-0.98)			
Bank of Communications	0.821***	-0.968***	0.082	0.5984	0.5927	2.190
	(22.03)	(-26.47)	(0.11)			
Beijing North Star	0.831***	-0.930***	1.078	0.2698	0.2622	1.939
	(11.96)	(-16.21)	(0.77)			
Beiren Printing and Machinery	1.001***	-0.715***	1.040	0.2263	0.2251	2.087
	(43.95)	(-24.99)	(1.08)			
China Citic Bank	0.931***	-0.829***	1.392	0.4170	0.4089	2.260
	(20.91)	(-19.23)	(1.43)			
China Coal Energy	0.969***	-1.479***	0.225	0.5671	0.5559	2.272
	(12.16)	(-19.00)	(0.15)			
China Construction Bank	0.757***	-1.061***	0.187	0.7034	0.6979	1.925
	(19.83)	(-37.14)	(0.29)			
China Cosco Holding	0.945***	-1.478***	1.840	0.4300	0.4213	1.915
	(10.81)	(-22.35)	(1.08)			
China Merchants Bank	0.817***	-0.906***	0.436	0.4467	0.4410	2.185
	(19.75)	(-21.93)	(0.49)			
China Oilfield Services	0.905***	-1.334***	0.530	0.4706	0.4607	2.123
	(11.33)	(-22.18)	(0.29)			
China Railway Construction	0.670***	-0.719***	-0.603	0.2548	0.2327	2.494
	(7.70)	(-7.30)	(-0.26)			
China Railway Group	0.759***	-0.794***	2.501*	0.3681	0.3541	1.803
	(13.89)	(-11.82)	(1.68)			
China Shenhua Energy	0.861***	-1.173***	-0.651	0.5180	0.5088	2.031
	(12.91)	(-20.37)	(-0.58)			
China Shipping Development	0.946***	-1.365***	0.509	0.5241	0.5135	2.089
	(11.09)	(-19.77)	(0.25)			
China Shipping Container	1.058***	-1.322***	-0.563	0.3470	0.3447	2.060
	(25.51)	(-29.05)	(-0.62)			
Datang International Power	1.106***	-1.222***	-0.322	0.3003	0.2923	1.814
	(12.69)	(-15.83)	(-0.26)			
Dongfang Electric	0.853***	-0.824***	0.490	0.1600	0.1584	2.038
	(27.01)	(-34.12)	(0.44)			
Guangzhou Pharmaceutical	0.803***	-0.627***	-0.078	0.1592	0.1567	2.060
	(23.97)	(-17.51)	(-0.08)			
Guangzhou Shipyard	0.935***	-0.795***	2.591***	0.2100	0.2088	2.054
	(30.27)	(-22.94)	(3.34)			
Huadian Power	1.176***	-1.200***	0.615	0.2327	0.2282	1.974
	(24.84)	(-21.89)	(0.71)			
Hisense Kelon	0.635***	-0.323***	-0.538	0.0676	0.065	1.883
	(10.10)	(-5.50)	(-0.31)			
Industrial and Commercial Bank	0.784***	-0.942	-0.716	0.6238	0.6197	2.020
	(23.65)	(-29.13)	(-1.17)			
Jingwei Textile	0.964***	-0.815***	1.727**	0.1742	0.1726	2.058
	(29.93)	(-27.38)	(2.27)			
Jiangsu Expressway	0.730***	-0.861***	-0.034	0.2515	0.2494	2.009
	(26.60)	(-28.05)	(-0.05)			
Jiangxi Cooper	1.008***	-1.310	0.546	0.3296	0.3274	2.132
	(26.61)	(-29.14)	(0.65)			
Maanshan Iron	0.791***	-1.083***	1.426	0.2576	0.2564	2.037
	(37.82)	(-35.93)	(1.44)			
Nanjing Panda	0.855***	-0.978***	-0.413	0.1359	0.1342	1.941
	(19.22)	(-25.99)	(-0.31)			
Northest Electric	0.624***	-0.889***	1.613	0.1177	0.1161	2.032
	(17.46)	(-24.57)	(1.19)			
Ping An Insurance	0.688***	-0.841***	-0.337	0.3721	0.3641	2.042
	(13.01)	(-13.48)	(-0.30)			
Shandong Chengming	0.919***	-0.766***	2.982	0.2614	0.2281	1.739
	(7.60)	(-7.23)	(1.35)			
Shangdong Xinhua	0.786***	-0.741***	-0.214	0.1722	0.1705	2.145
	(22.85)	(-25.21)	(-0.22)			
Shenji Group	0.999***	-0.7.7***	1.095	0.1639	0.1625	2.019
	(36.86)	(-19.54)	(1.08)			
Sinopec Yizheng	0.938***	-1.034***	1.019	0.2284	0.2271	1.965
	(46.26)	(-33.25)	(0.99)			
Tianjin Capital Environment	0.830***	-0.885***	0.511	0.1775	0.1761	2.045
	(27.44)	(-25.35)	(0.46)			
Tsigtao Brewery	0.786***	-0.667***	0.810	0.2296	0.2283	2.068
	(33.32)	(-25.64)	(1.19)			
Weichai Power	0.518***	-0.638***	1.200	0.1188	0.1065	2.094
	(6.72)	(-11.19)	(0.68)			
Zijin Mining	1.044***	-1.342***	3.408	0.4283	0.4083	2.008
	(7.52)	(-12.43)	(1.50)			
ZTE	0.502***	-0.814***	-0.812	0.2190	0.2145	2.100
	(10.27)	(-16.61)	(-0.76)			

*t statistics is shown in parenthesis, * denotes rejection at 10% significant level,*
*** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

Appendix 5.4: Regression output for Chinese shares dual or triple-listed on China A, Hong Kong and New York markets

		S&P	Hang Seng	Shanghai A	HK$/US$	RMB/US$	RMB/HK$	R Square	Adjusted R Square	DW
Aluminum	A-H	0.077	-1.426***	1.210***	-4.094	-4.200**	3.878**	0.5060	0.4956	2.139
		(0.84)	(-22.56)	(17.09)	(-1.10)	(-2.48)	(2.19)			
	A-N	-1.724***	-0.502***	1.092***	6.561	-2.810*	2.456	0.5609	0.5516	2.156
		(-22.28)	(-6.77)	(12.69)	(1.48)	(-1.92)	(1.37)			
	H-N	-1.023***	0.601***	-0.079***	1.422	-0.082	1.046*	0.3770	0.3739	2.745
		(-25.79)	(17.92)	(-3.15)	(1.22)	(-0.17)	(1.73)			
China Eastern Airlines	A-H	-0.131***	-1.075***	0.752***	-2.20	-0.437	0.643	0.1897	0.1872	2.135
		(-2.85)	(-34.47)	(18.43)	(-1.06)	(-0.45)	(0.63)			
	A-N	-0.666***	-0.584***	0.777***	-1.747	-0.627	0.443	0.1977	0.1952	2.138
		(-16.42)	(-18.59)	(24.77)	(-1.04)	(-1.37)	(0.52)			
	H-N	-0.892***	0.659***	0.089***	7.412***	0.223	0.184	0.1670	0.1646	2.636
		(-30.74)	(37.42)	(4.90)	(19.94)	(0.98)	(0.296)			
China United Telecom	A-H	0.031	-1.404***	0.965***	-1.693	-0.089	0.314	0.4078	0.4045	2.045
		(0.58)	(-35.97)	(33.27)	(-1.17)	(-0.20)	(0.43)			
	A-N	-1.297***	-0.691***	0.957***	0.579	-0.463	-0.400	0.4625	0.4595	2.077
		(-24.92)	(-16.31)	(29.38)	(0.41)	(-1.22)	(-0.53)			
	H-N	-1.261***	0.684***	-0.043**	2.522**	-0.490***	-0.537	0.4970	0.4950	2.560
		(-50.31)	(30.04)	(-2.31)	(2.17)	(-2.68)	(-1.21)			
China Life Insurance	A-H	0.089*	-1.004***	0.868***	-1.442	-0.200	-0.060	0.5586	0.5508	1.936
		(1.84)	(-30.25)	(23.83)	(-0.63)	(-0.24)	(-0.07)			
	A-N	-1.367***	-0.174***	0.825***	5.828*	1.124	-2.800*	0.5068	0.4981	2.147
		(-22.03)	(-3.07)	(13.82)	(1.89)	(0.93)	(-1.80)			
	H-N	-1.094***	0.584***	-0.014	0.584	-0.942***	0.105	0.4814	0.4778	2.755
		(-33.13)	(26.49)	(-0.69)	(0.66)	(-4.05)	(0.32)			
China Petrol	A-H	0.001	-1.141***	0.877***	-0.725	-0.259	-0.114	0.4255	0.4229	1.990
		(0.02)	(-36.20)	(29.40)	(-0.57)	(-0.56)	(-0.16)			
	A-N	-0.945***	-0.533***	0.871***	-2.294	-0.661*	0.247	0.3840	0.3811	2.238
		(-24.49)	(-14.31)	(25.99)	(-1.45)	(-1.78)	(0.29)			
	H-N	-0.751***	0.470***	0.008	-1.191	-0.808***	0.879*	0.3315	0.3284	2.845
		(-31.98)	(20.52)	(0.40)	(-1.17)	(-3.25)	(1.96)			
China Southern Airlines	A-H	-0.069	-0.893***	0.812***	1.456	0.250	0.915	0.1950	0.1898	2.158
		(-1.15)	(-16.34)	(16.61)	(0.82)	(0.30)	(0.94)			
	A-N	-1.260***	-0.346***	0.823***	-1.874	-0.836	1.518	0.2716	0.2670	2.174
		(-16.19)	(-5.85)	(16.28)	(-0.93)	(-1.41)	(1.60)			
	H-N	-0.781***	0.440***	-0.010	-1.987**	-0.564*	0.380	0.2204	0.2181	2.620
		(-26.40)	(23.77)	(-0.42)	(-2.30)	(-1.93)	(0.83)			
Guangshen Railway	A-H	0.429***	-0.830***	0.858***	2.660	-1.156	1.426	0.3551	0.3439	2.142
		(7.22)	(-16.40)	(16.26)	(1.02)	(-0.93)	(1.17)			
	A-N	-1.087***	-0.212***	0.784***	10.111***	-0.153	0.822	0.4329	0.4231	2.197
		(14.83)	(-4.28)	(14.29)	(3.72)	(-0.12)	(0.68)			
	H-N	-0.594***	0.345***	0.010	1.267***	-0.251	0.477	0.2070	0.2048	2.647
		(-26.80)	(21.99)	(0.62)	(3.62)	(-0.83)	(1.09)			
Huaneng Power	A-H	0.058	-0.933***	0.873***	0.058	-0.209	1.465**	0.2946	0.2911	1.943
		(1.20)	(-23.36)	(27.01)	(0.04)	(-0.34)	(2.54)			
	A-N	-0.740***	-0.424***	0.860***	2.35*	-1.01*	2.493***	0.3173	0.3139	2.018
		(-14.79)	(-9.74)	(23.75)	(1.84)	(1.85)	(3.41)			
	H-N	-0.0688***	0.389***	-0.017	1.475*	-0.856***	1.393***	0.2360	0.2336	2.731
		(-28.76)	(19.30)	(1.09)	(1.87)	(-5.11)	(4.51)			
Petro China	A-H	0.073	-1.328***	0.809***	-0.253	0.125	-1.362	0.7620	0.7546	2.037
		(1.44)	(-29.48)	(14.39)	(-0.10)	(0.16)	(-1.54)			
	A-N	-1.258***	-0.510***	0.730***	3.702	0.069	0.094	0.6919	0.6824	2.230
		(-26.00)	(-8.62)	(11.163)	(1.32)	(0.08)	(0.07)			
	H-N	-0.626***	0.402***	-0.011	-0.170	-0.255	1.354***	0.3244	0.3217	2.836
		(-26.18)	(18.94)	(-0.57)	(-0.20)	(-0.66)	(2.79)			
Sinopec Shanghai	A-H	0.062	-1.083***	0.827***	-0.621	0.192*	-0.086	0.3024	0.3008	1.972
		(1.40)	(-38.05)	(43.55)	(-0.40)	(1.96)	(-0.58)			
	A-N	-0.781***	-0.580***	0.840***	5.026***	0.030*	-0.086	0.2783	0.2767	2.033
		(-19.23)	(-21.15)	(40.87)	(7.41)	(1.65)	(-0.24)			
	H-N	-0.670***	0.419***	-0.009	-0.202	-0.090	-0.011	0.2381	0.2364	2.676
		(-26.42)	(26.86)	(-0.71)	(-0.49)	(-1.64)	(-0.07)			
Yanzhou Coal	A-H	0.046	-1.046***	0.921***	1.363	-0.776	-1.137	0.2364	0.2339	2.006
		(0.97)	(-27.36)	(26.24)	(0.81)	(-1.02)	(-0.16)			
	A-N	-0.468***	-0.592***	0.875***	3.541	-0.583	1.045	0.2055	0.2029	2.116
		(-10.20)	(-14.95)	(22.49)	(1.51)	(-0.75)	(1.34)			
	H-N	-0.617***	0.397***	-0.052**	0.088	-0.046	1.052**	0.1532	0.1500	2.664
		(-19.15)	(15.75)	(-2.41)	(0.11)	(-0.10)	(2.16)			
China Telecom	H-N	-0.512	0.268***	-0.368	1.231	0.363	4.235	0.3356	0.3214	2.142
		(-0.468)	(23.14)	(-1.02)	(1.01)	(0.59)	(1.41)			
China Mobile	H-N	-1.095***	0.540***	-0.020	0.909	-0.339***	0.335	0.4670	0.4654	2.570
		(-55.09)	(38.03)	(-1.29)	(1.13)	(-2.67)	(0.96)			
CNOOC	H-N	0.040	-0.017	0.050**	0.513	0.563	0.747	0.0031	0.0011	2.865
		(1.36)	(-0.62)	(2.08)	(0.35)	(0.54)	(-1.40)			

*t statistics is shown in parenthesis, * denotes rejection at 10% significant level,*
*** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*
A presents shares listed in China A-share market, H represents shares listed in Hong Kong market, N represents New York market

Appendix 6: Unit Root Test Results

Appendix 6.1: Unit Root Test Results for Chinese Firms Dual-Listed on China A- and B-Share Markets during the Period 1st January 1993 to 31st December 2008

		Model 1 (No drift no trend)		Model 2 (With drift)		Model 3 (With drift and trend)	
Price Series	**Market**	**Level**	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**
Anhui Guijing Distiller	A	-0.750	-50.715 ***	-1.540	-50.712 ***	-1.866	-50.704 ***
	B	-0.258	-25.304 ***	-1.992	-25.300 ***	-2.016	-25.299 ***
Bengang Steel Plate	A	-0.360	-51.784 ***	-1.874	-51.775 ***	-1.986	-51.767 ***
	B	0.255	-52.552 ***	-1.191	-52.547 ***	-1.766	-52.541 ***
BOE Technology	A	-0.863	-29.134 ***	-1.847	-29.138 ***	-1.847	-29.131 ***
	B	-0.163	-50.907 ***	-1.541	-50.899 ***	-1.341	-50.901 ***
Changchai Company	A	0.146	-58.894 ***	-2.489	-58.888 ***	-2.822	-58.941 ***
	B	-0.698	-54.132 ***	-1.761	-54.128 ***	-1.789	-54.120 ***
China Fanda	A	-0.157	-57.076 ***	-2.034	-57.067 ***	-3.967 ***	-57.095 ***
	B	0.324	-53.279 ***	-3.606	-53.277 ***	-3.634 **	-53.319 ***
China First Pencil	A	0.291	-66.074 ***	-2.348	-66.070 ***	-2.303	-66.074 ***
	B	0.728	-65.051 ***	-1.591	-65.059 ***	-1.806	-65.059 ***
China Interational Marine Container	A	1.046	-60.831 ***	-1.621	-60.852 ***	-1.589	-60.868 ***
	B	1.217	-58.408 ***	-1.151	-58.435 ***	-1.578	-58.435 ***
China Merchants Propert Development	A	0.523	-62.267 ***	-1.133	-62.267 ***	-2.443	-62.260 ***
	B	0.907	-60.601 ***	-1.221	-60.613 ***	-2.016	-60.606 ***
China Textile Machinery	A	-0.274	-62.746 ***	-2.663 *	-62.754 ***	-2.815	-62.761 ***
	B	-0.383	-61.172 ***	-1.559	-61.165 ***	-1.776	-61.157 ***
China Vanke	A	1.425	-63.796 ***	-0.234	-63.821 ***	-2.010	-63.824 ***
	B	1.417	-61.833 ***	-0.047	-61.859 ***	-2.485	-61.867 ***
Congqing Changan Automobile	A	-0.315	-52.763 ***	-1.419	-52.754 ***	-1.791	-52.746 ***
	B	0.221	-49.575 ***	-1.632	-49.571 ***	-1.500	-49.576 ***
CSG Holding	A	0.386	-63.256 ***	-1.656	-63.254 ***	-2.165	-63.247 ***
	B	0.229	-28.037 ***	-1.572	-28.038 ***	-2.090	-28.035 ***
Dalian Referigerator	A	0.065	-46.131 ***	-1.778	-46.126 ***	-1.631	-46.129 ***
	B	0.122	-51.641 ***	-1.519	-51.634 ***	-1.592	-51.630 ***
Danhua chemical	A	0.090	-59.112 ***	-1.580	-59.106 ***	-1.615	-59.099 ***
	B	0.155	-38.275 ***	-1.348	-38.265 ***	-1.638	-38.257 ***
Dazhong Transportation	A	0.690	-41.917 ***	-2.425	-41.908 ***	-2.527	-41.905 ***
	B	0.686	-41.185 ***	-1.970	-41.183 ***	-2.566	-41.176 ***
Double Coin	A	-0.759	-44.287 ***	-2.595	-44.301 ***	-2.816	-44.292 ***
	B	-0.467	-40.413 ***	-1.903	-40.406 ***	-1.949	-40.419 ***
Eastern Communications	A	-0.472	-42.934 ***	-1.335	-42.939 ***	-1.835	-42.964 ***
	B	0.165	-41.797 ***	-1.970	-41.792 ***	-1.854	-41.785 ***
Foshan Electrical	A	0.315	-34.177 ***	-1.646	-34.170 ***	-2.423	-34.165 ***
	B	0.957	-45.234 ***	-1.370	-45.242 ***	-2.065	-45.278 ***
Guangdong Electric Power	A	0.542	-42.339 ***	-1.404	-42.334 ***	-1.306	-42.326 ***
	B	0.555	-45.288 ***	-1.645	-45.277 ***	-1.261	-45.317 ***
Guangdong Provincial Expressway	A	-0.319	-43.255 ***	-1.962	-43.257 ***	-1.907	-43.249 ***
	B	0.305	-44.650 ***	-1.720	-44.643 ***	-2.084	-44.663 ***
Guandgong Sunrise	A	-0.979	-39.956 ***	-1.402	-40.003 ***	-1.690	-40.023 ***
	B	-0.711	-36.465 ***	-1.839	-36.462 ***	-1.910	-36.460 ***
Hainan Airlines	A	-0.518	-43.514 ***	-1.413	-43.514 ***	-1.703	-43.504 ***
	B	-0.395	-41.485 ***	-1.735	-41.477 ***	-1.754	-41.482 ***
Hainan Dadonghai Tourism	A	-1.299	-41.889 ***	-1.301	-41.904 ***	-1.771	-41.897 ***
	B	-0.373	-23.631 ***	-1.699	-23.628 ***	-1.693	-23.632 ***
Hainan Pearl River Holdings	A	-0.453	-22.059 ***	-2.045	-22.058 ***	-2.028	-22.078 ***
	B	-0.222	-18.269 ***	-1.740	-18.265 ***	-1.834	-18.260 ***
Hefei Meiling	A	-0.492	-43.485 ***	-2.095	-43.488 ***	-2.360	-43.479 ***
	B	-0.397	-42.136 ***	-2.257	-42.126 ***	-2.272	-42.122 ***

Note: A represents shares listed and traded on China A market; B represents shares listed and traded on China B market
** denotes rejection at 10% significant level, ** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

(cont.)

Price Series	Market	Model 1 (No drift no trend) Level	Model 1 (No drift no trend) First Difference	Model 2 (With drift) Level	Model 2 (With drift) First Difference	Model 3 (With drift and trend) Level	Model 3 (With drift and trend) First Difference
Huadian Energy	A	-0.369	-44.454 ***	-1.734	-44.469 ***	-2.282	-44.458 ***
	B	0.288	-42.081 ***	-2.537	-42.072 ***	-2.019	-42.100 ***
Huangshan Tourism	A	0.053	-34.732 ***	-1.247	-34.726 ***	-2.045	-34.739 ***
	B	0.964	-44.739 ***	-1.518	-44.741 ***	-1.620	-44.731 ***
Huaxin Cement	A	0.171	-43.053 ***	-1.767	-43.044 ***	-2.709	-43.046 ***
	B	1.079	-40.285 ***	-0.753	-40.294 ***	-1.884	-40.284 ***
Inner Mongolia Eerduosica	A	-0.303	-33.246 ***	-1.454	-33.238 ***	-1.863	-33.254 ***
	B	0.763	-43.535 ***	-0.879	-43.546 ***	-1.757	-43.550 ***
Jiangling Motors	A	-0.028	-45.514 ***	-1.876	-45.505 ***	-3.151 *	-45.496 ***
	B	0.510	-43.505 ***	-1.681	-43.508 ***	-2.063	-43.543 ***
Jinan Qingqi Motorcycle	A	-0.336	-40.428 ***	-1.458	-40.425 ***	-1.449	-40.420 ***
	B	-0.852	-39.124 ***	-1.704	-39.116 ***	-1.698	-39.108 ***
Jinshan Development	A	-0.420	-39.906 ***	-1.710	-39.905 ***	-1.730	-39.897 ***
	B	-0.372	-39.670 ***	-1.393	-39.661 ***	-1.965	-39.660 ***
Jinzhou Port	A	-0.390	-43.851 ***	-2.027	-43.848 ***	-2.315	-43.838 ***
	B	0.351	-41.979 ***	-1.653	-41.969 ***	-1.076	-41.993 ***
Konka Group	A	-0.049	-45.561 ***	-1.636	-45.561 ***	-1.598	-45.572 ***
	B	0.104	-44.136 ***	-2.485	-44.128 ***	-2.445	-44.118 ***
Livzon Pharmaceutical	A	0.637	-42.273 ***	-1.192	-42.264 ***	-2.010	-42.278 ***
	B	0.840	-43.763 ***	-1.094	-43.774 ***	-2.214	-43.766 ***
Luthai Textile	A	0.298	-41.958 ***	-1.236	-41.952 ***	-1.646	-41.942 ***
	B	1.401	-43.620 ***	-1.254	-43.646 ***	-1.502	-43.671 ***
SGSB Group	A	-0.538	-43.946 ***	-2.834 *	-43.948 ***	-2.814	-43.938 ***
	B	-0.537	-41.756 ***	-1.399	-41.749 ***	-1.930	-41.755 ***
Shangdong Chenming Paper	A	-0.366	-44.366 ***	-1.590	-44.355 ***	-1.726	-44.348 ***
	B	0.394	-32.860 ***	-1.142	-32.866 ***	-2.179	-32.919 ***
	H	-2.065 **	-10.428 ***	-1.140	-10.648 ***	-1.097	-10.655 ***
Shanghai Automation Instrument	A	-0.554	-39.890 ***	-2.412	-39.888 ***	-2.406	-39.888 ***
	B	0.108	-38.277 ***	-1.627	-38.268 ***	-1.994	-38.259 ***
Shanghai Baosight	A	-0.121	-43.523 ***	-2.340	-43.513 ***	-3.465 **	-43.506 ***
	B	0.609	-40.138 ***	-1.267	-40.132 ***	-2.120	-40.128 ***
Shanghai Chlor-Alkali	A	-0.579	-43.432 ***	-2.283	-43.445 ***	-2.590	-43.438 ***
	B	-0.044	-40.528 ***	-1.775	-40.520 ***	-1.806	-40.525 ***
Shanghai Diesel	A	-0.332	-43.298 ***	-3.485 ***	-43.290 ***	-3.580 **	-43.280 ***
	B	-0.049	-40.874 ***	-1.674	-40.864 ***	-2.027	-40.875 ***
Shanghai Dingli Technology	A	-0.149	-40.179 ***	-2.505	-40.182 ***	-2.510	-40.182 ***
	B	0.164	-38.201 ***	-1.106	-38.192 ***	-1.666	-38.185 ***
Shanghai Erfangji	A	-0.649	-42.208 ***	-2.283	-42.215 ***	-2.319	-42.205 ***
	B	-0.403	-40.620 ***	-1.488	-40.616 ***	-1.497	-40.629 ***
Shanghai Friendship	A	0.481	-44.280 ***	-1.680	-44.270 ***	-2.663	-44.260 ***
	B	0.801	-42.675 ***	-0.714	-42.677 ***	-2.343	-42.686 ***
Shanghai Haixin Group	A	-0.093	-41.059 ***	-1.748	-41.050 ***	-1.868	-41.068 ***
	B	0.478	-41.083 ***	-1.382	-41.073 ***	-1.593	-41.097 ***
Shanghai Highly Group	A	-0.172	-44.877 ***	-3.151 **	-44.875 ***	-3.229 *	-44.864 ***
	B	0.417	-43.213 ***	-1.648	-43.203 ***	-1.841	-43.212 ***
Shanghai Jinjiang Hotel	A	0.058	-44.253 ***	-2.389	-44.242 ***	-2.701	-44.233 ***
	B	0.642	-43.823 ***	-1.342	-43.819 ***	-1.812	-43.831 ***
Shanghai Jinjiang International	A	-0.525	-45.730 ***	-3.334 **	-45.721 ***	-4.284 ***	-45.711 ***
	B	0.620	-32.758 ***	-1.109	-32.760 ***	-1.863	-32.769 ***
Shanghai Jinqiao	A	0.213	-44.591 ***	-3.641 ***	-44.582 ***	-3.516 **	-44.571 ***
	B	0.488	-43.107 ***	-1.852	-43.098 ***	-1.881	-43.112 ***

Note: A represents shares listed and traded on China A market; B represents shares listed and traded on China B market
** denotes rejection at 10% significant level, ** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

Price Series	Market	Model 1 (No drift no trend) Level	Model 1 (No drift no trend) First Difference	Model 2 (With drift) Level	Model 2 (With drift) First Difference	Model 3 (With drift and trend) Level	Model 3 (With drift and trend) First Difference
Shanghai Kaikai	A	-0.809	-44.636 ***	-1.880	-44.632 ***	-1.847	-44.625 ***
	B	-0.051	-40.938 ***	-1.481	-40.930 ***	-1.435	-40.922 ***
Shanghai Lujiazui Finance & Trade Zone	A	0.286	-43.453 ***	-2.533	-43.443 ***	-2.475	-43.436 ***
	B	0.477	-42.145 ***	-1.565	-42.140 ***	-1.936	-42.136 ***
Shanghai Mechanic and Electrical	A	0.425	-43.716 ***	-1.909	-43.705 ***	-2.511	-43.696 ***
	B	0.515	-42.288 ***	-1.177	-42.283 ***	-1.862	-42.283 ***
Shanghai MRA Trading	A	-0.478	-45.196 ***	-2.797 *	-45.199 ***	-2.786	-45.188 ***
	B	0.211	-41.950 ***	-1.151	-41.940 ***	-1.580	-41.938 ***
Shanghai Nine Dragon	A	-1.040	-44.328 ***	-1.545	-44.331 ***	-1.414	-44.328 ***
	B	0.512	-42.417 ***	-2.047	-42.407 ***	-1.793	-42.400 ***
Shanghai Potevio	A	-0.191	-43.621 ***	-2.429	-43.632 ***	-2.280	-43.623 ***
	B	-0.066	-41.640 ***	-1.642	-41.632 ***	-1.779	-41.632 ***
Shanghai Sanmao	A	-0.280	-45.209 ***	-2.318	-45.205 ***	-2.367	-45.201 ***
	B	0.070	-41.260 ***	-1.442	-41.251 ***	-1.660	-41.248 ***
Shanghai Wingsung	A	-0.454	-44.068 ***	-2.457	-44.074 ***	-2.391	-44.063 ***
	B	-0.300	-40.225 ***	-1.534	-40.216 ***	-2.099	-40.210 ***
Shanghai Yaohua Pilkington	A	-0.369	-43.000 ***	-2.555	-42.994 ***	-2.616	-42.984 ***
	B	-0.394	-41.234 ***	-1.311	-41.224 ***	-1.791	-41.237 ***
Shanghai Zhenhua Port Machinery	A	1.001	-44.570 ***	-0.794	-44.585 ***	-1.220	-44.575 ***
	B	1.045	-42.870 ***	-0.786	-42.908 ***	-1.881	-42.932 ***
Shenzhen SEG	A	-0.659	-40.469 ***	-1.085	-40.490 ***	-1.909	-40.483 ***
	B	-0.283	-41.840 ***	-2.156	-41.838 ***	-2.374	-41.850 ***
Shenzhen Special Economic Zone	A	-0.721	-44.604 ***	-2.152	-44.612 ***	-2.116	-44.605 ***
	B	-0.606	-42.390 ***	-2.012	-42.383 ***	-2.020	-42.401 ***
Shenzhen Textile	A	0.018	-44.701 ***	-2.744 *	-44.697 ***	-2.681	-44.686 ***
	B	-0.001	-42.054 ***	-1.856	-42.044 ***	-2.329	-42.055 ***
Shenzhen Accord Pharmaceutical	A	0.554	-42.833 ***	-1.284	-42.824 ***	-1.845	-42.880 ***
	B	0.713	-42.414 ***	-1.206	-42.409 ***	-1.878	-42.400 ***
Shenzhen International Enterprise	A	-0.197	-41.476 ***	-2.571	-41.471 ***	-2.914	-41.465 ***
	B	0.350	-41.516 ***	-2.351	-41.506 ***	-2.326	-41.498 ***
Shenzhen Nanshan Power	A	0.316	-41.822 ***	-2.477	-41.825 ***	-1.604	-41.843 ***
	B	0.335	-19.177 ***	-1.236	-19.173 ***	-0.687	-19.286 ***
Shenzhen Properties and Resources	A	-0.699	-40.732 ***	-2.277	-40.735 ***	-2.338	-40.725 ***
	B	-0.688	-40.198 ***	-2.524	-40.189 ***	-2.527	-40.212 ***
Shenzhen Shenbao Industrial	A	-0.387	-42.702 ***	-1.974	-42.702 ***	-2.046	-42.692 ***
	B	-0.217	-41.150 ***	-1.823	-41.140 ***	-2.348	-41.146 ***
Shenzhen Tellus	A	-0.605	-40.434 ***	-2.322	-40.435 ***	-2.318	-40.426 ***
	B	-0.415	-38.301 ***	-2.300	-38.292 ***	-2.400	-38.308 ***
Shenzhen Victor Onward Textile	A	-0.645	-42.741 ***	-2.170	-42.756 ***	-2.155	-42.747 ***
	B	-0.594	-41.380 ***	-2.185	-41.379 ***	-2.168	-41.397 ***
Shenzhen Zhongheng Huafa	A	-0.738	-42.451 ***	-1.676	-42.476 ***	-1.660	-42.467 ***
	B	-0.547	-38.360 ***	-1.811	-38.360 ***	-1.824	-38.374 ***
Shijianzhuang Baoshi	A	-0.695	-42.523 ***	-2.020	-42.524 ***	-2.442	-42.519 ***
	B	-0.427	-24.264 ***	-1.642	-24.261 ***	-1.624	-24.270 ***
SVA Electron	A	-0.221	-25.568 ***	-1.667	-25.588 ***	-1.444	-25.585 ***
	B	-0.055	-24.790 ***	-1.322	-24.790 ***	-1.630	-24.800 ***
Weifu High Technology	A	0.166	-44.332 ***	-2.064	-44.326 ***	-1.535	-44.320 ***
	B	0.170	-42.174 ***	-1.635	-42.164 ***	-1.574	-42.222 ***
Wuxi Littleswan	A	-0.974	-32.559 ***	-1.724	-32.560 ***	-1.791	-32.564 ***
	B	-0.083	-41.989 ***	-2.084	-41.979 ***	-2.157	-41.969 ***
Yantai Changyu	A	1.317	-43.700 ***	0.035	-43.733 ***	-2.198	-43.748 ***
	B	-0.238	-42.373 ***	-0.238	-42.467 ***	-2.450	-42.466 ***
Zhong Lu	A	-0.162	-43.482 ***	-2.929 **	-43.474 ***	-3.169 *	-43.476 ***
	B	-0.263	-41.852 ***	-1.478	-41.842 ***	-2.591	-41.837 ***

Note: A represents shares listed and traded on China A market; B represents shares listed and traded on China B market
** denotes rejection at 10% significant level, ** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

Appendix 6.2: Unit Root Test Results for Chinese Firms Dual-Listed on China A Share Market and Hong Kong Market during the Period 1st January 1993 to 31st December 2008

		Model 1 (No drift no trend)		Model 2 (With drift)		Model 3 (With drift and trend)	
RI Series	**Market**	**Level**	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**
Air China	A	0.179	-22.197 ***	-1.405	-22.184 ***	-0.645	-22.542 ***
	H	-0.333	-30.063 ***	-1.017	-30.050 ***	-0.513	-30.070 ***
Angang Steel	A	0.437	-52.232 ***	-0.816	-52.229 ***	-1.875	-52.223 ***
	H	0.772	-50.799 ***	-0.620	-50.807 ***	-3.140 *	-50.806 ***
Anhui Conch Cement	A	0.960	-39.468 ***	-1.009	-39.486 ***	-1.177	-39.479 ***
	H	1.419	-51.846 ***	-0.198	-51.875 ***	-2.922	-51.879 ***
Anhui Expressway	A	-0.084	-41.588 ***	-2.147	-41.575 ***	-1.698	-41.607 ***
	H	0.350	-54.958 ***	-0.982	-54.954 ***	-1.979	-54.945 ***
Bank of China	A	-0.384	-26.556 ***	-0.814	-26.540 ***	-0.786	-26.656 ***
	H	-0.659	-28.402 ***	-1.118	-28.400 ***	-1.763	-28.457 ***
Bank of Communications	A	-1.567	-21.720 ***	-0.069	-21.827 ***	-1.873	-21.859 ***
	H	0.695	-30.693 ***	-1.979	-30.701 ***	-0.853	-30.808 ***
Beijing North Star	A	-0.291	-22.184 ***	-0.606	-22.166 ***	-1.783	-22.493 ***
	H	-0.714	-50.928 ***	-2.076	-50.922 ***	-2.980	-50.919 ***
Beiren Printing and Machinery	A	-0.420	-62.243 ***	-2.391	-62.236 ***	-2.281	-62.236 ***
	H	-0.504	-63.150 ***	-1.669	-63.144 ***	-1.691	-63.137 ***
China Citic Bank	A	-1.650 *	-23.374 ***	-0.362	-23.482 ***	-2.649	-23.499 ***
	H	-1.307	-21.489 ***	-0.879	-21.542 ***	-2.329	-21.531 ***
China Coal Energy	A	-2.088 **	-15.372 ***	-0.314	-15.665 ***	-2.421	-15.631 ***
	H	0.013	-18.944 ***	-1.479	-18.927 ***	-1.456	-19.066 ***
China Construction Bank	A	-1.503	-17.930 ***	-0.109	-18.025 ***	-4.178 ***	-18.050 ***
	H	0.672	-29.303 ***	-2.181	-29.309 ***	-1.617	-29.372 ***
China Cosco Holding	A	-0.842	-17.973 ***	0.414	-17.993 ***	-2.369	-18.298 ***
	H	0.180	-26.852 ***	-1.109	-26.841 ***	-0.383	-26.871 ***
China Merchants Bank	A	0.738	-41.554 ***	-0.816	-41.560 ***	-0.982	-41.551 ***
	H	0.249	-22.617 ***	-1.838	-22.603 ***	-1.250	-22.778 ***
China Oilfield Services	A	-1.780	-16.969 ***	-0.700	-17.087 ***	-2.499	-17.062 ***
	H	0.711	-38.956 ***	-1.203	-38.963 ***	-1.791	-38.955 ***
China Railway Construction	A	-0.355	-16.806 ***	-2.641 *	-16.780 ***	-2.847	-16.787 ***
	H	-0.132	-16.049 ***	-3.122 **	-16.009 ***	-3.351 ***	-15.973 ***
China Railway Group	A	-0.763	-17.279 ***	-0.970	-17.275 ***	-2.186	-17.248 ***
	H	-0.505	-14.768 ***	-1.290	-14.754 ***	-4.040 ***	-14.726 ***
China Shenhua Energy	A	-2.145 **	-16.297 ***	-0.154	-16.521 ***	-3.420 *	-16.498 ***
	H	0.549	-27.533 ***	-1.677	-27.535 ***	-0.792	-27.597 ***
China Ship Container	A	-2.518 **	-17.019 ***	-0.932	-17.337 ***	-3.160 *	-17.307 ***
	H	-0.338	-32.076 ***	-1.095	-32.063 ***	-0.772	-32.088 ***
China Shipping Development	A	0.450	-39.464 ***	-1.463	-39.462 ***	-0.637	-39.497 ***
	H	0.462	-58.323 ***	-0.950	-58.322 ***	-2.604	-58.317 ***
Datang International Power	A	0.041	-22.056 ***	-1.196	-22.037 ***	-1.286	-22.231 ***
	H	0.498	-34.686 ***	-1.056	-34.689 ***	-2.739	-34.689 ***

Note: A represents shares listed and traded on China A market; H represents shares listed and traded on Hong Kong market,
** denotes rejection at 10% significant level, ** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

(*cont.*)

RI Series	Market	Model 1 (No drift no trend) Level	Model 1 (No drift no trend) First Difference	Model 2 (With drift) Level	Model 2 (With drift) First Difference	Model 3 (With drift and trend) Level	Model 3 (With drift and trend) First Difference
Dongfang Electric	A	0.298	-31.693 ***	-0.812	-31.693 ***	-2.952	-31.715 ***
	H	0.649	-58.538 ***	-0.388	-58.541 ***	-1.740	-58.560 ***
Guangzhou Pharmaceutical	A	-0.861	-34.704 ***	-1.665	-34.709 ***	-1.659	-34.702 ***
	H	0.330	-52.045 ***	-1.244	-52.040 ***	-2.263	-52.031 ***
Guangzhou Shipyard	A	0.289	-62.549 ***	-1.267	-62.545 ***	-1.974	-62.538 ***
	H	0.194	-60.177 ***	-0.902	-60.173 ***	-1.509	-60.178 ***
Hisense Kelon	A	-1.813 *	-46.146 ***	-1.111	-46.190 ***	-1.665	-46.181 ***
	H	-0.724	-40.413 ***	-1.116	-40.413 ***	-2.640	-40.411 ***
Huadian Power	A	-0.221	-30.892 ***	-1.156	-30.863 ***	-1.365	-30.863 ***
	H	0.214	-36.959 ***	-1.678	-36.955 ***	-2.198	-36.952 ***
Industrial and Commerce Bank	A	0.084	-22.247 ***	-1.730	-22.228 ***	-1.927	-22.444 ***
	H	0.164	-24.166 ***	-2.529	-24.147 ***	-2.299	-24.186 ***
Jiangsu Expressway	A	-0.240	-34.771 ***	-1.785	-34.764 ***	-2.174	-34.764 ***
	H	0.541	-34.717 ***	-0.803	-34.722 ***	-3.785	-34.731 ***
Jiangxi Cooper	A	0.469	-18.072 ***	-1.325	-18.076 ***	-1.243	-18.088 ***
	H	0.201	-51.190 ***	-0.875	-51.185 ***	-3.232	-51.186 ***
Jingwei Textile	A	-1.422	-54.190 ***	-2.419	-54.204 ***	-2.631	-54.197 ***
	H	-0.345	-56.769 ***	-1.519	-56.761 ***	-1.701	-56.756 ***
Maanshan Iron	A	-0.134	-63.040 ***	-2.030	-63.032 ***	-3.154 *	-63.024 ***
	H	-0.252	-59.448 ***	-1.279	-59.441 ***	-2.102	-59.455 ***
Nanjing Panda	A	-0.809	-54.016 ***	-1.788	-54.014 ***	-2.173	-54.008 ***
	H	-0.503	-54.553 ***	-2.248	-54.545 ***	-2.365	-54.537 ***
Northest Electric	A	-0.695	-58.439 ***	-2.857 *	-58.434 ***	-2.882	-58.429 ***
	H	-0.668	-43.511 ***	-1.937	-43.507 ***	-2.747	-43.503 ***
Ping An Insurance	A	1.119	-20.947 ***	-1.310	-20.944 ***	-0.701	-21.156 ***
	H	-0.688	-32.652 ***	-0.067	-32.683 ***	-1.881	-32.703 ***
Shangdong Xinhua	A	-0.779	-53.242 ***	-1.245	-53.238 ***	-2.045	-53.233 ***
	H	-0.431	-58.627 ***	-2.058	-58.619 ***	-2.438	-58.610 ***
Shenji Group	A	0.140	-61.290 ***	-1.617	-61.284 ***	-2.185	-61.277 ***
	H	-0.398	-60.166 ***	-1.374	-60.159 ***	-2.480	-60.184 ***
Sinopec Yizheng	A	-0.102	-57.905 ***	-2.605 *	-57.897 ***	-2.520	-57.898 ***
	H	-0.587	-34.415 ***	-3.082 **	-34.412 ***	-3.081	-34.408 ***
Tianjin Capital Environment	A	-0.035	-32.906 ***	-2.175	-32.902 ***	-2.128	-32.899 ***
	H	-0.048	-61.659 ***	-1.687	-61.652 ***	-2.529	-61.644 ***
Tsigtao Brewery	A	0.281	-64.985 ***	-1.123	-64.980 ***	-3.954 **	-64.991 ***
	H	0.683	-47.281 ***	-0.691	-47.288 ***	-1.747	-47.294 ***
Weichai Power	A	-1.145	-19.453 ***	0.058	-19.486 ***	-2.429	-19.572 ***
	H	0.224	-30.544 ***	-1.663	-30.536 ***	-1.613	-30.539 ***
Zijin Mining	A	-2.122 **	-12.347 ***	-2.429	-12.494 ***	-1.053	-12.691 ***
	H	1.149	-32.301 ***	-1.031	-32.340 ***	-1.299	-32.335 ***
ZTE	A	1.235	-52.030 ***	-1.834	-52.058 ***	-2.790	-52.060 ***
	H	0.052	-31.761 ***	-2.118	-31.747 ***	-2.410	-31.743 ***

Note: A represents shares listed and traded on China A market; H represents shares listed and traded on Hong Kong market,
** denotes rejection at 10% significant level, ** denotes rejection at 5% significant level, *** denotes rejection at 1% significant level*

Appendix 6.3: Unit Root Test Results for Chinese Firms Dual or Triple-Listed on China A, Hong Kong, and New York Markets during the Period 1st January 1993 to 31st December 2008

		Model 1 (No drift no trend)		Model 2 (With drift)		Model 3 (With drift and trend)	
RI Series	**Market**	**Level**	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**
Aluminum	A	-1.150	-19.989 ***	0.558	-20.033 ***	-2.101	-20.301 ***
	H	0.543	-39.276 ***	-1.539	-39.279 ***	-0.802	-39.309 ***
	N	0.595	-42.419 ***	-1.476	-42.424 ***	-0.657	-42.454 ***
China Eastern Airlines	A	-0.513	-49.274 ***	-1.916	-49.267 ***	-1.999	-49.259 ***
	H	-0.325	-54.567 ***	-1.956	-54.559 ***	-2.320	-54.550 ***
	N	-0.362	-54.427 ***	-1.892	-54.418 ***	-2.320	-54.409 ***
China United Telecom	A	0.561	-42.546 ***	-1.153	-42.546 ***	-1.355	-42.534 ***
	H	-0.568	-35.209 ***	-1.985	-35.203 ***	-2.329	-35.215 ***
	N	-0.508	-38.029 ***	-1.819	-38.022 ***	-2.171	-38.036 ***
China Life Insurance	A	-0.913	-23.051 ***	-0.438	-23.066 ***	-1.599	-23.105 ***
	H	1.537	-37.287 ***	-0.975	-37.355 ***	-1.104	-37.350 ***
	N	1.624	-41.825 ***	-0.957	-41.897 ***	-1.069	-41.891 ***
China Petrol and Chemical	A	0.453	-44.603 ***	-0.965	-44.599 ***	-1.653	-44.588 ***
	H	0.972	-44.987 ***	-1.006	-45.001 ***	-2.159	-44.993 ***
	N	0.973	-50.549 ***	-0.950	-50.565 ***	-2.254	-50.555 ***
China Southern Airlines	A	0.009	-34.492 ***	-1.035	-34.480 ***	-0.872	-34.476 ***
	H	-0.708	-51.788 ***	-2.304	-51.782 ***	-3.142 *	-51.776 ***
	N	-0.707	-54.432 ***	-2.228	-54.426 ***	-3.092	-54.420 ***
Guangshen Railway	A	-0.784	-25.390 ***	-0.176	-25.392 ***	-2.706	-25.510 ***
	H	0.106	-57.039 ***	-1.089	-57.032 ***	-2.358	-57.032 ***
	N	0.238	-43.270 ***	-0.956	-43.267 ***	-2.364	-43.270 ***
Huaneng Power	A	0.120	-41.343 ***	-1.726	-41.333 ***	-1.812	-41.324 ***
	H	0.718	-34.236 ***	-0.851	-34.245 ***	-2.431	-34.239 ***
	N	0.680	-59.446 ***	-0.900	-59.449 ***	-2.540	-59.443 ***
Petro China	A	-3.194 ***	-18.079 ***	-2.169	-18.545 ***	-3.253 *	-18.590 ***
	H	1.753	-29.855 ***	-1.258	-29.939 ***	-1.015	-29.956 ***
	N	1.788	-36.857 ***	-1.280	-36.936 ***	-1.082	-36.950 ***
Sinopec Shanghai	A	0.308	-61.461 ***	-1.555	-61.457 ***	-2.255	-61.449 ***
	H	0.154	-61.639 ***	-1.920	-61.634 ***	-2.222	-61.627 ***
	N	0.184	-63.815 ***	-1.746	-63.810 ***	-2.111	-63.802 ***
Yanzhou Coal	A	0.335	-52.489 ***	-1.588	-52.485 ***	-2.188	-52.477 ***
	H	0.528	-49.657 ***	-1.140	-49.658 ***	-3.083	-49.649 ***
	N	0.632	-39.031 ***	-1.096	-39.038 ***	-2.825	-39.032 ***
China Mobile	H	1.296	-52.456 ***	-1.300	-52.479 ***	-1.566	-52.470 ***
	N	1.305	-41.764 ***	-1.195	-41.798 ***	-1.505	-41.791 ***
China Telecom	H	0.732	-26.546 ***	-1.994	-26.559 ***	-1.954	-26.606 ***
	N	0.709	-33.261 ***	-2.014	-33.269 ***	-1.695	-33.303 ***
CNOOC	H	1.740	-44.261 ***	-1.001	-44.325 ***	-2.905	-44.317 ***
	N	1.733	-35.545 ***	-1.175	-35.633 ***	-3.022	-35.628 ***

Note: A represents shares listed and traded on China A market; H represents shares listed and traded on Hong Kong market, and N represents shares listed and traded on New York market;

Appendix 7: Granger-causality Test Results

Appendix 7.1: Granger causality test Results for Chinese Firms Dual-Listed on China A- and B-Share Markets

	Pairwise Granger Causality H_o: No causality from China A to China B		Pairwise Granger Causality H_o: No causality from China B to China A	
	F-Statistic	Prob.	F-Statistic	Prob.
Anhui Guijing Distiller	0.653	0.625	0.859	0.488
Bengang Steel Plate	2.507 **	0.040	0.983	0.416
BOE Technology	4.737 ***	0.001	4.575 ***	0.001
Changchai Company	0.416	0.797	0.793	0.529
China Fanda	1.115	0.348	0.261	0.903
China First Pencil	5.189 ***	0.000	0.751	0.557
China Interational Marine Container	0.894	0.467	1.489	0.203
China Merchants Propert Development	4.364 ***	0.002	4.822 ***	0.001
China Textile Machinery	9.452 ***	0.000	2.786 **	0.025
China Vanke	2.099 *	0.078	2.301 *	0.056
Congqing Changan Automobile	2.826 **	0.024	0.855	0.490
CSG Holding	0.633	0.639	2.317 *	0.055
Dalian Referigerator	3.087 **	0.015	0.569	0.685
Danhua chemical	3.948 ***	0.003	4.955 ***	0.001
Dazhong Transportation	1.602	0.171	1.652	0.158
Double Coin	0.241	0.915	0.718	0.579
Eastern Communications	2.774 **	0.026	0.903	0.461
Foshan Electrical	0.854	0.491	2.562 **	0.037
Guangdong Electric Power	0.296	0.881	1.176	0.319
Guangdong Provincial Expressway	0.524	0.718	0.854	0.491
Guandgong Sunrise	2.670 **	0.031	14.536 ***	0.000
Hainan Airlines	1.872	0.113	0.475	0.754
Hainan Dadonghai Tourism	7.700 ***	0.000	1.708	0.145
Hainan Pearl River Holdings	14.128 ***	0.000	2.812 **	0.024
Hefei Meiling	0.868	0.483	1.741	0.138
Huadian Energy	1.416	0.226	0.629	0.642
Huangshan Tourism	1.165	0.324	0.417	0.796
Huaxin Cement	2.458 **	0.044	1.048	0.381
Inner Mongolia Eerduosica	1.307	0.265	0.520	0.721
Jiangling Motors	3.233 **	0.012	1.394	0.233
Jinan Qingqi Motorcycle	1.066	0.372	2.484 **	0.042
Jinshan Development	4.780 ***	0.001	1.568	0.180
Jinzhou Port	3.837 ***	0.004	0.652	0.625
Konka Group	2.866	0.022	0.276	0.894
Livzon Pharmaceutical	2.774 **	0.026	1.009	0.402
Luthai Textile	1.769	0.132	1.441	0.218
SGSB Group	2.501 **	0.041	0.289	0.885
Shangdong Chenming Paper	0.710	0.585	0.806	0.521
Shanghai Automation Instrument	4.774 ***	0.001	3.199 **	0.012
Shanghai Baosight	10.137 ***	0.000	2.234 *	0.063
Shanghai Chlor-Alkali	0.393	0.814	0.482	0.749
Shanghai Diesel	1.242	0.291	1.337	0.254
Shanghai Dingli Technology	3.798 ***	0.004	5.192 ***	0.000
Shanghai Erfangji	7.937 ***	0.000	1.351	0.248
Shanghai Friendship	0.336	0.854	2.930 **	0.020
Shanghai Haixin Group	0.855	0.490	3.046 **	0.016
Shanghai Highly Group	1.310	0.264	2.793 **	0.025
Shanghai Jinjiang Hotel	1.154	0.329	2.412 **	0.047
Shanghai Jinjiang International	2.207 *	0.066	1.310	0.264
Shanghai Jinqiao	2.359 *	0.051	1.273	0.278
Shanghai Kaikai	4.286 ***	0.002	12.727 ***	0.000
Shanghai Lujiazui Finance & Trade Zone	0.479	0.751	1.884	0.110
Shanghai Mechanic and Electrical	2.951 **	0.019	5.526 ***	0.000
Shanghai MRA Trading	2.252 *	0.061	1.211	0.304
Shanghai Nine Dragon	1.680	0.152	2.557 **	0.037
Shanghai Potevio	1.070	0.370	0.572	0.683
Shanghai Sanmao	2.812 **	0.024	0.758	0.552
Shanghai Wingsung	3.308 **	0.010	1.891	0.109
Shanghai Yaohua Pilkington	1.781	0.130	1.074	0.367
Shanghai Zhenhua Port Machinery	1.559	0.183	1.917	0.105
Shenzhen SEG	0.697	0.594	2.571 **	0.036
Shenzhen Special Economic Zone	0.424	0.791	3.441 ***	0.008
Shenzhen Textile	2.365 *	0.051	1.050	0.380
Shenzhen Accord Pharmaceutical	4.070 ***	0.003	3.535 ***	0.007
Shenzhen International Enterprise	0.658	0.621	6.222 ***	0.000
Shenzhen Nanshan Power	4.382 ***	0.002	1.289	0.272
Shenzhen Properties and Resources	1.971 *	0.096	6.364 ***	0.000
Shenzhen Shenbao Industrial	13.281 ***	0.000	0.753	0.556
Shenzhen Tellus	12.890 ***	0.000	5.252 ***	0.000
Shenzhen Victor Onward Textile	12.713 ***	0.000	2.777 **	0.026
Shenzhen Zhongheng Huafa	11.603 ***	0.000	3.790 ***	0.004
Shijianzhuang Baoshi	1.440	0.218	2.057 *	0.084
SVA Electron	6.115 ***	0.000	0.259	0.904
Weifu High Technology	0.386	0.818	2.060 *	0.083
Wuxi Littleswan	1.384	0.237	0.475	0.754
Yantai Changyu	0.299	0.878	4.422 ***	0.001
Zhong Lu	3.275 **	0.011	2.008 *	0.091

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level*

Appendix 7.2: Granger causality test Results for Chinese Firms Dual-Listed on China A-Share and Hong Kong Markets

	Pairwise Granger Causality H_o: No causality from China A to Hong Kong		Pairwise Granger Causality H_o: No causality from Hong Kong to China A	
	F-Statistic	Prob.	F-Statistic	Prob.
Air China	0.396	0.812	3.841 ***	0.004
Angang Steel	3.223 **	0.012	7.432 ***	0.000
Anhui Conch Cement	0.380	0.823	11.716 ***	0.000
Anhui Expressway	0.778	0.540	3.117 **	0.015
Bank of China	0.331	0.857	0.952	0.433
Bank of Communications	1.061	0.375	0.986	0.415
Beijing North Star	0.725	0.575	3.048 **	0.017
Beiren Printing and Machinery	1.798	0.126	1.963 *	0.097
China Citic Bank	4.033 ***	0.003	1.857	0.117
China Coal Energy	0.925	0.450	1.532	0.194
China Construction Bank	0.920	0.453	0.638	0.636
China Cosco Holding	1.893	0.111	2.518 **	0.041
China Merchants Bank	1.503	0.200	2.322 *	0.056
China Oilfield Services	1.035	0.389	2.013 *	0.092
China Railway Construction	1.724	0.146	0.727	0.575
China Railway Group	3.874 ***	0.005	1.850	0.120
China Shenhua Energy	2.901 **	0.022	3.502 ***	0.008
China Ship Container	3.090 **	0.017	1.250	0.290
China Shipping Development	0.887	0.471	6.427 ***	0.000
Datang International Power	2.087 *	0.081	0.802	0.524
Dongfang Electric	0.145	0.965	8.639 ***	0.000
Guangzhou Pharmaceutical	4.436 ***	0.001	1.066	0.372
Guangzhou Shipyard	2.121 *	0.076	5.473 ***	0.000
Hisense Kelon	0.670	0.613	0.253	0.908
Huadian Power	1.367	0.243	2.519 **	0.040
Industrial and Commerce Bank	0.711	0.585	0.647	0.630
Jiangsu Expressway	0.988	0.413	0.467	0.760
Jiangxi Cooper	0.272	0.896	9.963 ***	0.000
Jingwei Textile	1.523	0.193	4.203 ***	0.002
Maanshan Iron	1.814	0.123	2.783 **	0.025
Nanjing Panda	3.157 **	0.013	0.438	0.781
Northest Electric	0.449	0.774	2.984 **	0.018
Ping An Insurance	2.445 **	0.046	2.595 **	0.036
Shangdong Xinhua	0.835	0.503	1.745	0.137
Shenji Group	5.938 ***	0.000	1.167	0.324
Sinopec Yizheng	7.977 ***	0.000	0.643	0.632
Tianjin Capital Environment	1.151	0.331	1.234	0.294
Tsigtao Brewery	2.490 **	0.041	3.678 ***	0.005
Weichai Power	2.362 *	0.053	1.213	0.304
Zijin Mining	2.698 **	0.033	0.369	0.830
ZTE	5.313 ***	0.000	1.200	0.309

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level*

Appendix 7.3: Granger causality test Results for Chinese Firms Dual-Listed on China A- Share, Hong Kong and New York Markets

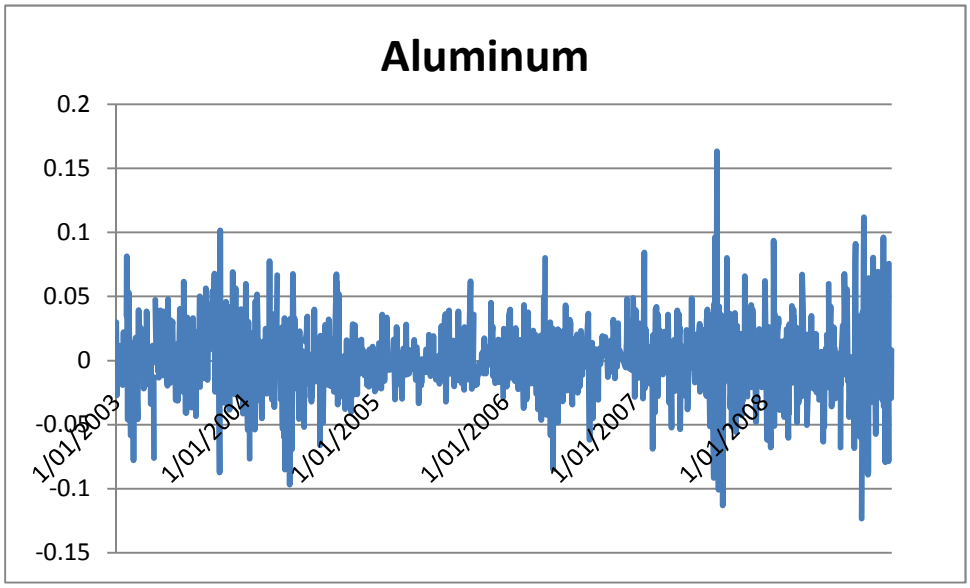
Panel A:	**Pairwise Granger Causality** H_o**: No causality from China A to New York**		**Pairwise Granger Causality** H_o**: No causality from New York to China A**	
	F-Statistic	Prob.	F-Statistic	Prob.
Aluminum	1.931	0.104	6.977 ***	0.000
China Eastern Airlines	1.175	0.320	15.205 ***	0.000
China United Telecom	1.046	0.382	3.893 ***	0.004
China Life Insurance	1.408	0.230	5.394 ***	0.000
China Petrol and Chemical	1.206	0.306	6.287 ***	0.000
China Southern Airlines	2.280 *	0.059	13.695 ***	0.000
Guangshen Railway	3.448 ***	0.009	1.212	0.305
Huaneng Power	1.148	0.332	6.982 ***	0.000
Petro China	0.717	0.581	3.934 ***	0.004
Sinopec Shanghai	1.637	0.162	1.889	0.110
Yanzhou Coal	0.955	0.431	5.971 ***	0.000

Panel B:	**Pairwise Granger Causality** H_o**: No causality from China A to Hong Kong**		**Pairwise Granger Causality** H_o**: No causality from Hong Kong to China A**	
	F-Statistic	Prob.	F-Statistic	Prob.
Aluminum	1.982 *	0.096	3.494 ***	0.008
China Eastern Airlines	1.003	0.405	8.749 ***	0.000
China United Telecom	1.324	0.259	3.028 **	0.017
China Life Insurance	1.012	0.400	0.242	0.914
China Petrol and Chemical	2.595 **	0.035	6.287 ***	0.000
China Southern Airlines	1.331	0.256	9.380 ***	0.000
Guangshen Railway	2.919 **	0.021	0.773	0.543
Huaneng Power	1.516	0.195	4.081 ***	0.003
Petro China	0.637	0.637	0.624	0.646
Sinopec Shanghai	0.833	0.504	2.496 **	0.041
Yanzhou Coal	1.164	0.325	3.554 ***	0.007

Panel C:	**Pairwise Granger Causality** H_o**: No causality from Hong Kong to New York**		**Pairwise Granger Causality** H_o**: No causality from New York to Hong Kong**	
	F-Statistic	Prob.	F-Statistic	Prob.
Aluminum	6.435 ***	0.000	137.622 ***	0.000
China Eastern Airlines	66.311 ***	0.000	27.663 ***	0.000
China United Telecom	6.389 ***	0.000	146.943 ***	0.000
China Life Insurance	3.230 **	0.012	88.449 ***	0.000
China Petrol and Chemical	12.386 ***	0.000	80.723 ***	0.000
China Southern Airlines	30.197 ***	0.000	47.973 ***	0.000
Guangshen Railway	16.178 ***	0.000	68.092 ***	0.000
Huaneng Power	9.332 ***	0.000	155.145 ***	0.000
Petro China	9.268 ***	0.000	141.044 ***	0.000
Sinopec Shanghai	28.365 ***	0.000	56.800 ***	0.000
Yanzhou Coal	36.414 ***	0.000	31.055 ***	0.000
China Mobile	9.674 ***	0.000	222.707 ***	0.000
China Telecom	6.705 ***	0.000	75.760 ***	0.000
CNOOC	5.194 ***	0.000	197.529 ***	0.000

** denotes statistical significance at the 10% level, ** denotes statistical significance at the 5% level,*
**** denotes statistical significance at the 1% level*

Appendix 8: Price Premium for Dual-listings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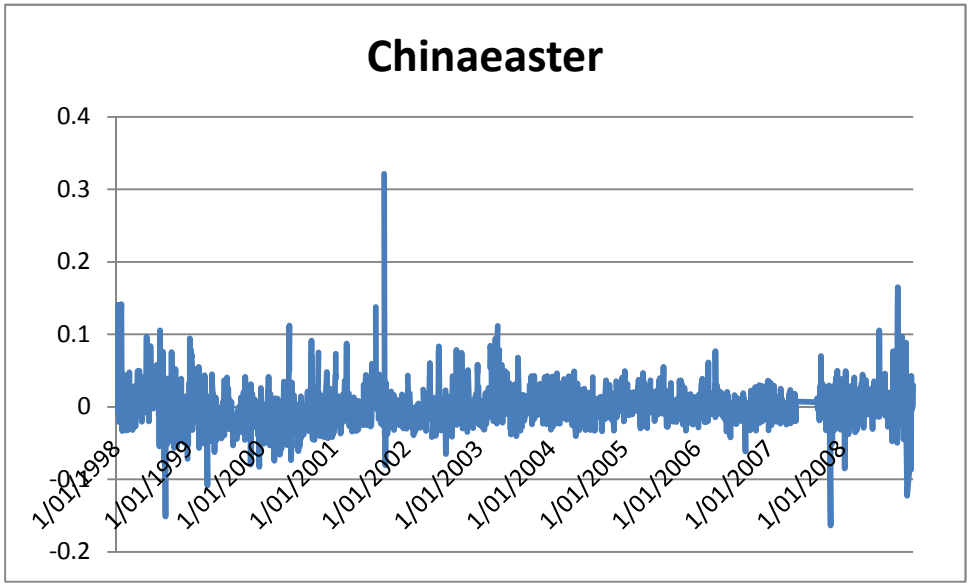
1/01/2004
1/01/2005
1/01/2006
1/01/2007
1/01/2008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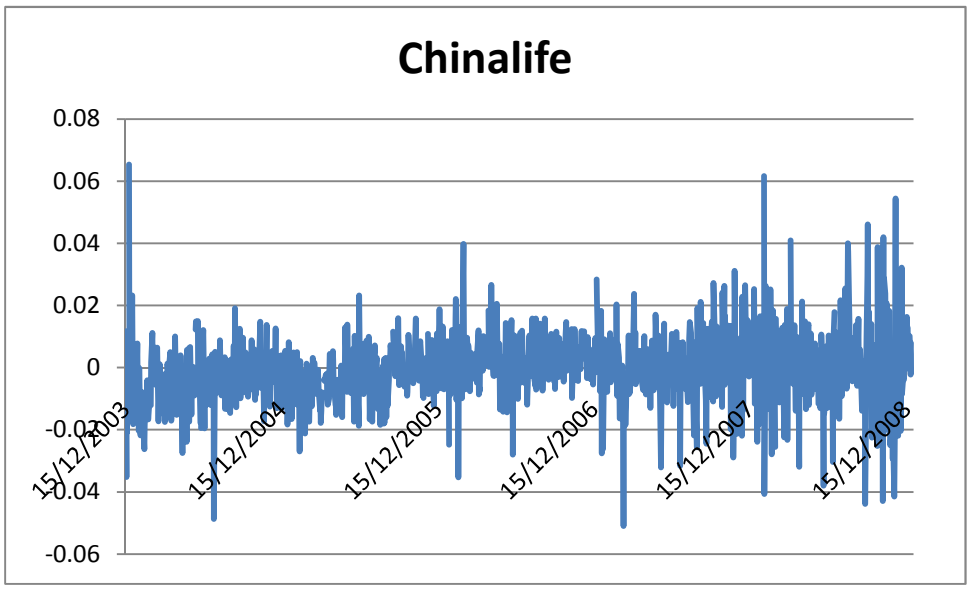
1/01/2007
1/01/2008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15/12/2004
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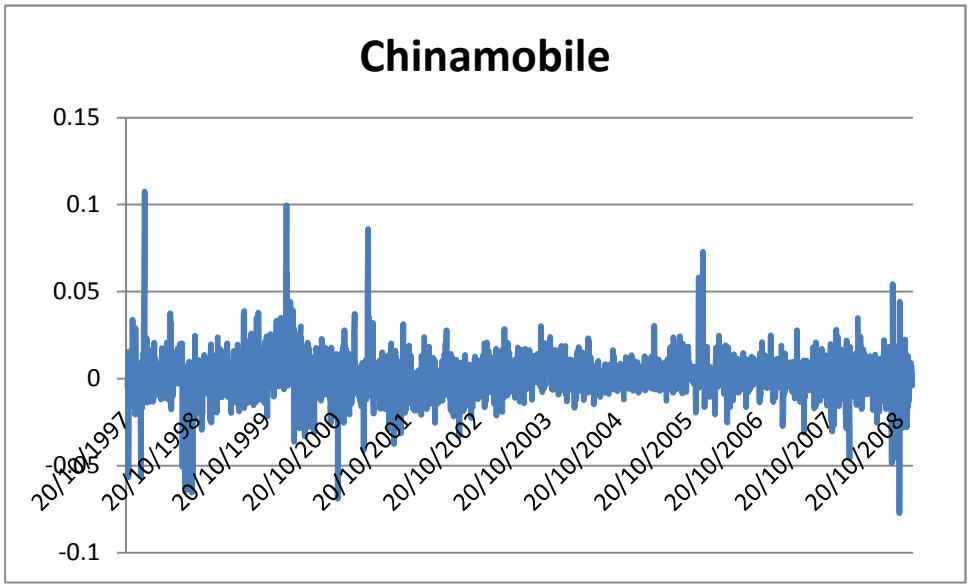
15/12/2007
15/12/2008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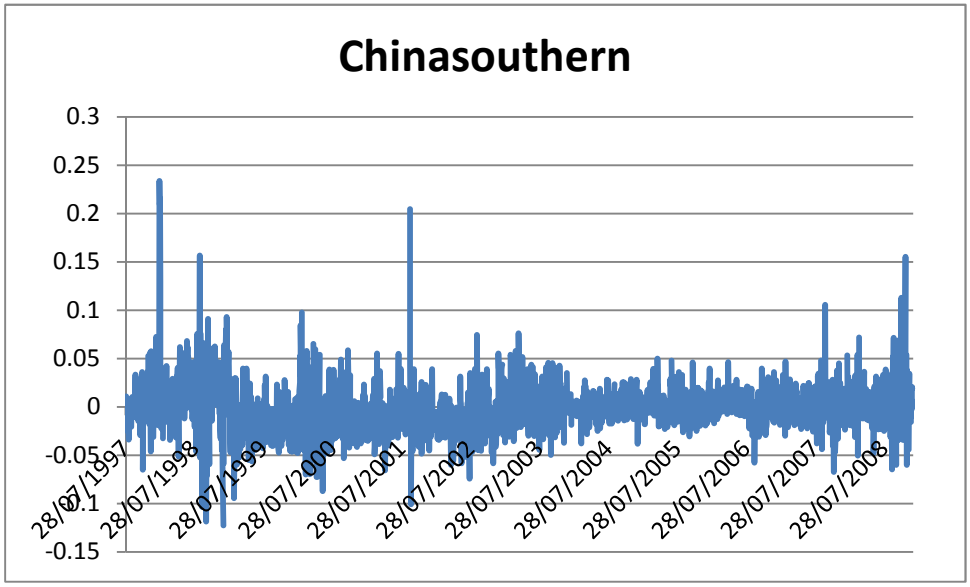
20/10/2008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28/07/2005
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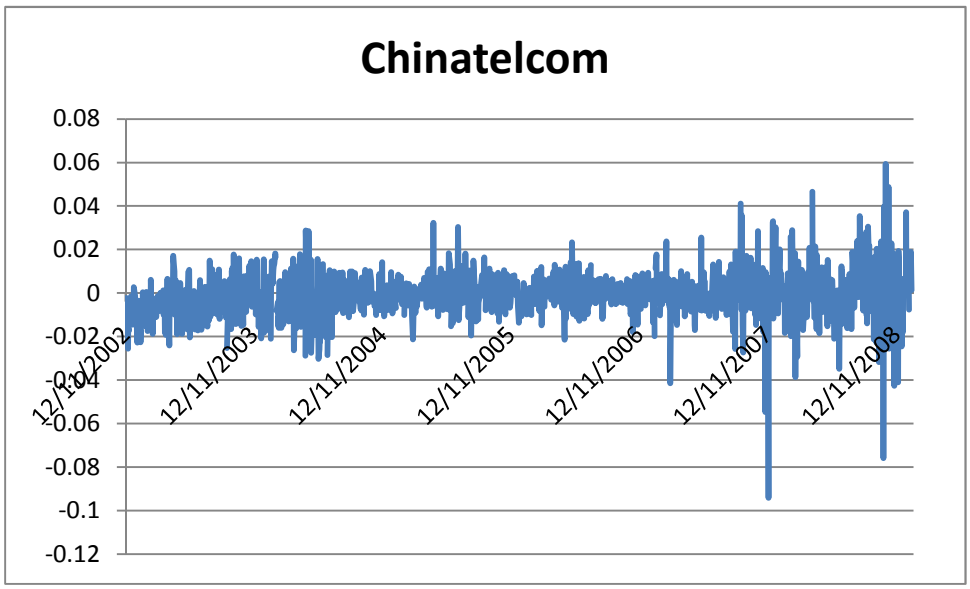
28/07/2008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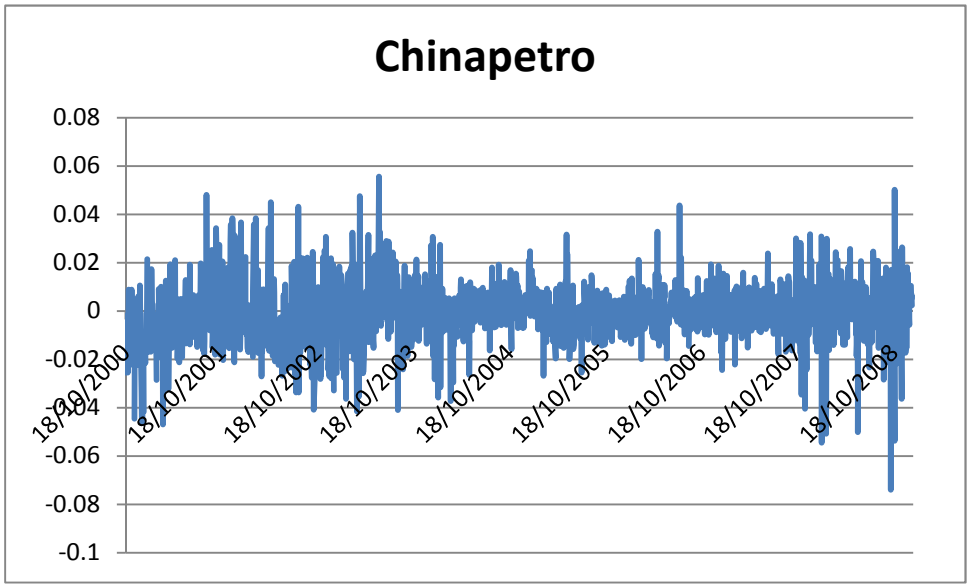
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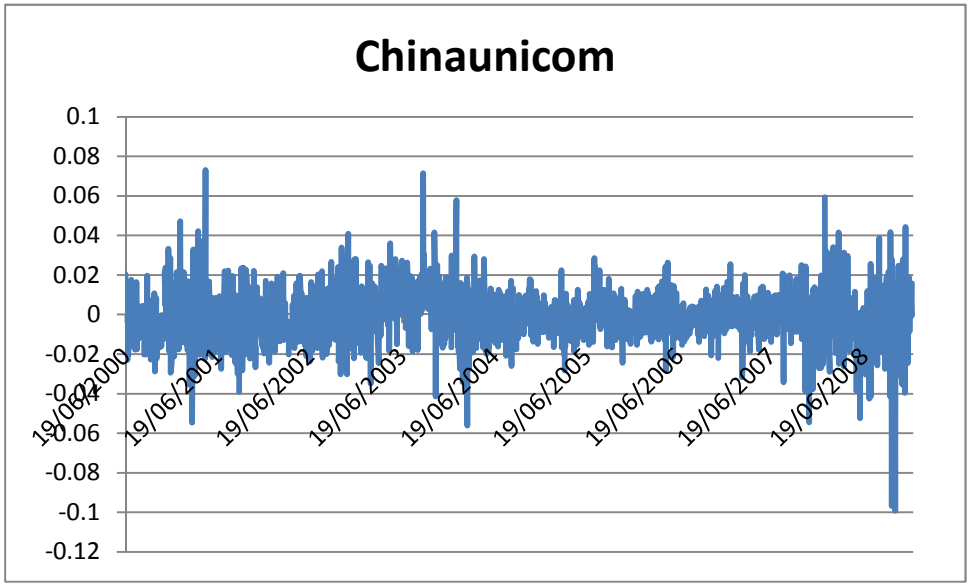
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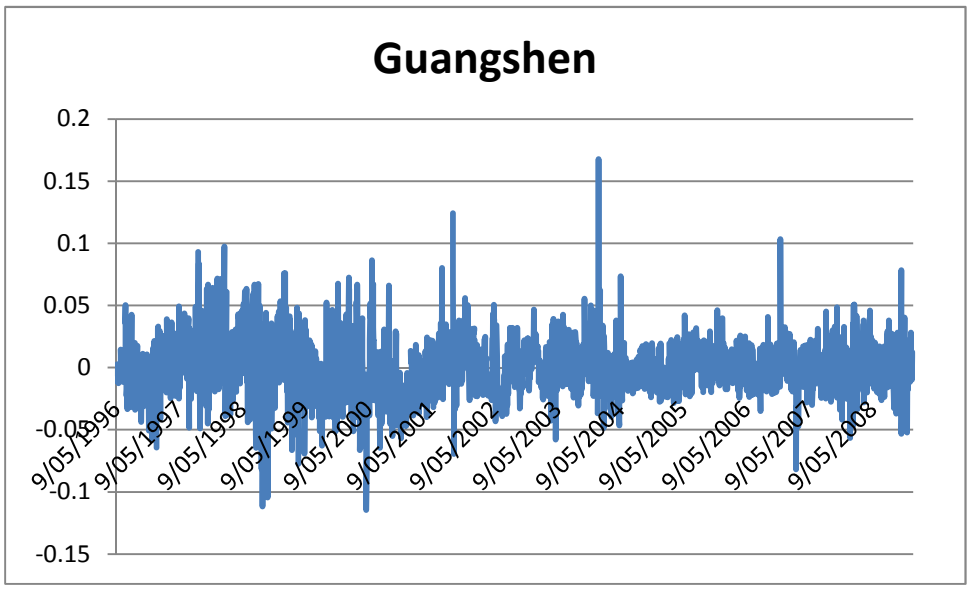
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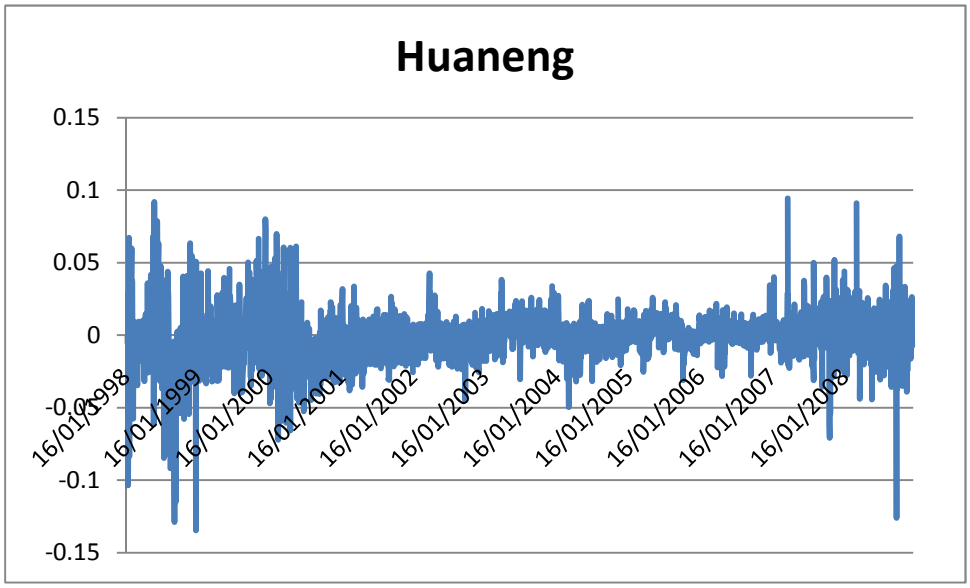
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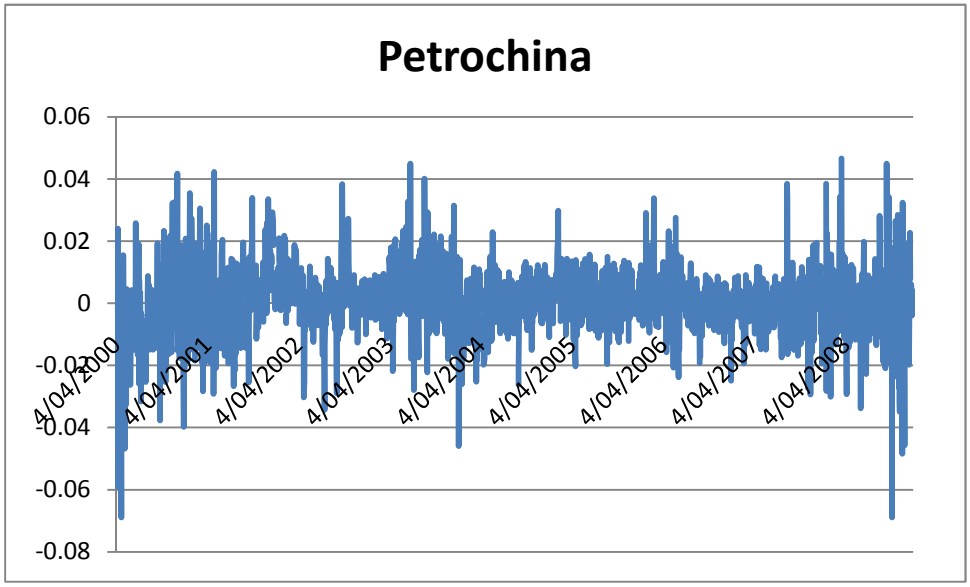
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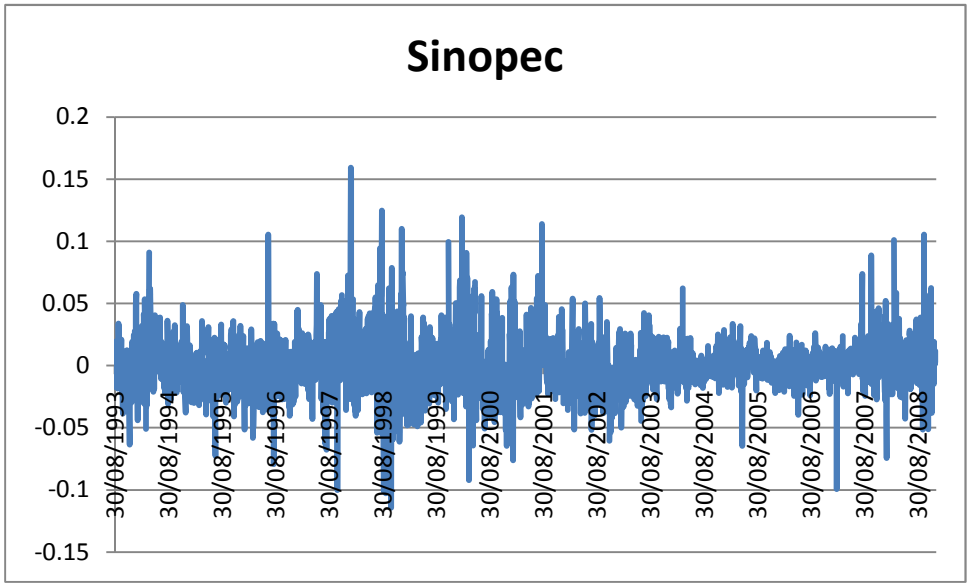
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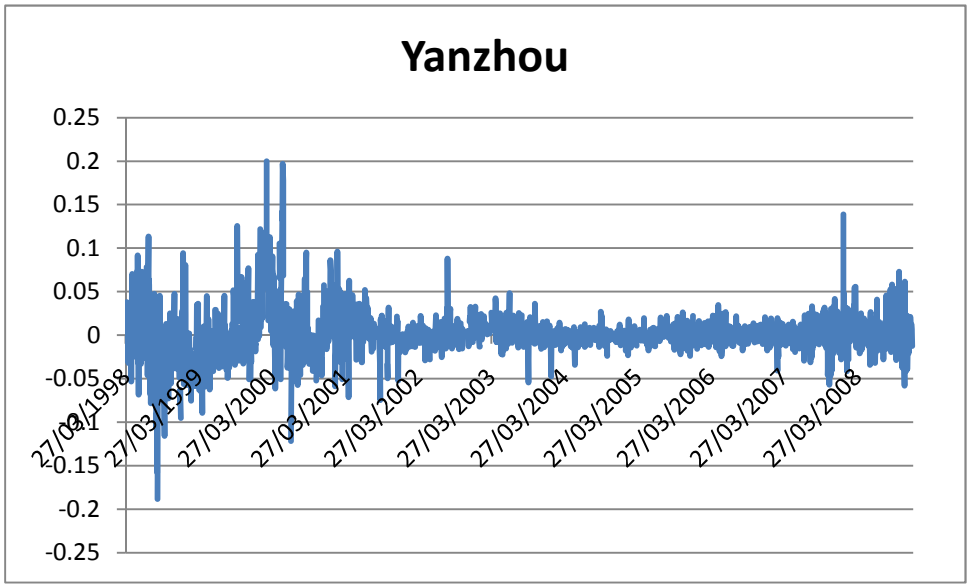
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